CALIFORNIA
1904
LOUIS ROSSOW CO. LITH. S. F.

CALIFORNIA

ITS PRODUCTS
RESOURCES
INDUSTRIES and
ATTRACTIONS

WHAT IT OFFERS THE IMMIGRANT, HOMESEEKER, INVESTOR and TOURIST

Published by the
CALIFORNIA LOUISIANA PURCHASE
EXPOSITION COMMISSION

COMMISSION:

GOV. GEO. C. PARDEE, J. A. FILCHER, FRANK WIGGINS

EDITED BY T. G. DANIELLS

SACRAMENTO
W. W. SHANNON - - SUPERINTENDENT STATE PRINTING
1904

CONTENTS.

		PAGE.
PREFACE		3
HISTORICAL SKETCH	*Carrie J. Pratt*	5
TOPOGRAPHICAL CONSIDERATIONS	*J. A. Filcher*	10
CLIMATE OF CALIFORNIA	*N. P. Chipman*	15
THE TRIUMPH OF IRRIGATION	*Wm. E. Smythe*	22
THE MINERAL WEALTH OF CALIFORNIA	*Lewis E. Aubury*	32
THE OIL INDUSTRY OF CALIFORNIA	*Dr. C. T. Deane*	41
AGRICULTURE IN CALIFORNIA	*Arthur R. Briggs*	46
HORTICULTURE IN CALIFORNIA	*E. J. Wickson*	58
ORANGE-GROWING IN CALIFORNIA	*A. H. Naftzger*	70
ORANGES IN THE SIERRA FOOTHILLS	*J. Parker Whitney*	74
THE OLIVE IN CALIFORNIA	*George C. Roeding*	79
VITICULTURE IN CALIFORNIA	*Charles Bundschu*	85
RAISIN-GROWING IN CALIFORNIA	*D. D. Allison*	89
THE FIG IN CALIFORNIA	*George C. Roeding*	96
THE FORESTS OF CALIFORNIA	*W. H. Mills*	102
THE LUMBER INDUSTRY OF CALIFORNIA	*E. J. Holt*	110
THE FISHES OF CALIFORNIA	*David Starr Jordan*	118
CATTLE-RAISING IN CALIFORNIA	*Peter J. Shields*	124
DAIRY INDUSTRY OF CALIFORNIA	*Arthur R. Briggs*	131
POULTRY-RAISING IN CALIFORNIA	*L. C. Byce*	135
THE HONEY INDUSTRY IN CALIFORNIA	*George L. Emerson*	139
THE BEET-SUGAR INDUSTRY OF CALIFORNIA	*James M. Taylor*	142
COMMERCE AND COMMERCIAL RELATIONS OF CALIFORNIA	*James D. Phelan*	146
MANUFACTURES OF CALIFORNIA	*Charles E. Bancroft*	154
BANKS AND BANKING	*J. K. Lynch*	158
CALIFORNIA'S SCHOOLS	*Robert Furlong*	165
MORAL AND RELIGIOUS LIFE IN CALIFORNIA	*Rev. Charles R. Brown*	171
THE OUTDOOR LIFE OF CALIFORNIA	*William Greer Harrison*	177
CALIFORNIA'S HEALTH RESORTS	*A. J. Wells*	183
TRAVELING IN CALIFORNIA	*Elwyn Hoffman*	191
PAST AND PRESENT OF THE FRANCISCAN MISSIONS OF CALIFORNIA	*J. R. Knowland*	197
CALIFORNIA'S CALL TO THE IMMIGRANT	*John P. Irish*	206

PREFACE.

The purpose of this book is to disseminate accurate information regarding California. It is to give those who seek enlightenment facts and figures that in every instance may be verified upon personal investigation. There is no purpose in exaggerating the resources and attractions of such a marvelous land as California. One of the contributors to these pages writes: "I have told everything just as I would want it told me if I had in view a change of location. The truth is plenty good enough as to anything concerning California." That spirit, it is trusted, has been carried out in every paragraph and sentence of the book. Each subject has been treated by one who has particular knowledge of it and who has undertaken the task through love of his State and a desire to render it a service; and also, possibly, because of a feeling that something which may have gone before needs more careful treatment. Some of the contributors are of national renown; all are recognized in California as particularly qualified to write on their several subjects.

If the details of this little work are curtailed, it is because of an embarrassment of riches, rather than a lack of them. To amplify and supplement the matter here set forth the reader may obtain printed or specifically written information from any of several large bureaus maintained for that purpose up and down the State—the State Board of Trade and Promotion Committee of San Francisco; Chambers of Commerce of Los Angeles, Sacramento, Oakland, San Jose, Fresno and Stockton; and if anything further is desired regarding still smaller communities, a board of trade or similar body maintained at every county seat and in most of the towns will, upon request, promptly forward reliable information.

This book is issued by mandate of the law carrying the appropriation through which California is enabled to place an exhibit at the Louisiana Purchase Exposition. In that respect it is official, and by that fact it must be realized that it is in the interest of no individual; of no single community. It is for the whole of California—designated by one of the greatest of Americans as that "Empire of the Pacific," whose extent and importance he expressed in that title, and whose destiny he so clearly foreshadowed.

With this brief introduction, the California Commission to the Louisiana Purchase Exposition present this book, in the hope that it will be accepted as a true, earnest and impartial presentation of the conditions in California; as giving reliable information to all who may be seeking it.

CALIFORNIA

Its Products, Resources, Industries and Attractions.

HISTORICAL SKETCH.

By CARRIE J. PRATT.

Many and diverse are the elements which have gone into the making of the "Golden State." Strangely different actors have played their part, and left their impress where they played. The country itself and its aboriginal inhabitants were long a source of attraction to the Spanish conquerors. In 1536, Cortes and his followers superficially inspected Lower California. They likened the land to the famous island of Amazons, described in the old Spanish romance, "Sergas de Espladian," in which the author speaks of "the great island of California, where an abundance of gold and precious stones is found." With the inherent poesy of the Spanish race they named the territory California.

In 1542, Cabrillo sailed along the coast, and over a century later Viscaino explored it, mapping the bays of San Diego and Monterey. Sir Francis Drake, Queen Elizabeth's daring buccaneer, in cruising the Pacific for Spain's treasure ships, discovered, in 1579, the bay which bears his name. He called the land "New Albion."

Spain's desire for new possessions and the missionary zeal of the Franciscans under the leadership of Father Junipero Serra led to the colonization of California in 1768. This fervid religious enthusiast, and Jose Galvez, visitador-general to Mexico from Spain, fitted out four expeditions which set out by land and sea. The vicissitudes of travel were many. Finally, the travelers reached San Diego, and on July 16, 1769, they founded the mission of that name. Despite their exhausted condition, a detachment was sent northward to find the bay of Monterey, which had been mapped out by Viscaino. It was this party that missed its objective point and found instead the important bay of San Francisco. This discovery led to the establishment of the mission of San Francisco, in the year of our national independence.

By the end of 1823, when the last and most northerly mission had been planted at Sonoma, these religious houses had grown to twenty-one in number and had acquired great wealth in olive, orange and grape plantations and herds of cattle and horses. The Indians were converted to Christianity, weaned from their barbaric and nomadic state, and induced to lead a settled life. The Spanish government provided a presidio, or military station, near each mission. The pueblos, also a sort of adjunct to the missions, were towns established to promote the settlement of the country. They maintained local and civil government independent of church or military rule. To Californians of the present day, the missions are memorials of the older civilization which keep alive the continuity of historic interest. The ruined buildings are a source of inspiration to artists and the motifs for much of the domestic, civic and religious architecture of Modern California.

As the years rolled on, explorers of different nationalities now and again touched at points along the coast, but only the Russians established a settlement, which, however, was abandoned after a short period.

The political situation of the whole country was much altered when, in 1822, the many revolutionary upheavals in Mexico culminated in her proclamation of independence from Spain. The republican government was unfavorable to the Church, and the Mexican congress enacted a law providing for the dispersion of the Franciscan fathers of California and a division of their vast principalities among the settlers and the Indians. Soon after this the secularization of the missions began. They were stripped of their wealth; the buildings were neglected, the Indians scattered, and the ownership of the land fell to the lot of the Mexican rancheros. These were mostly of Spanish lineage, whose principal occupation was the raising of cattle for hides and tallow. They were, on the whole, a simple, kindly and unprogressive people, much given to picturesque apparel, gay colors and fiestas. They rode a great deal, visited one another frequently, enjoyed many sports, music and dancing, lived to a ripe old age, and had very large families. These were the days of boundless hospitality, when every stranger was welcome at the haciendas and became a guest for as long as he chose to remain. Those happy patriarchal times of the splendid idle forties—how they vanished upon the advent of the gringo—the stranger from across the plains!

By 1846 a number of Americans had found their way to the new territory. They had come as trappers and traders, and were men of valor and sturdiness—the heralds of Anglo-Saxon supremacy. A spirit of local independence developed rapidly among them. This led to a silent conflict between them and the Mexicans, resulting in a jealousy of Mexican control and bitter political feuds between rival factions around Monterey in the north and Los Angeles in the south.

About this time the attention of the United States government began to be strongly attracted toward California, and the French

and the English were looking in this direction with a view to possibly taking possession of the country.

All the circumstances connected with the seizing of California will probably never be known. It appears, however, that the authorities at Washington, having determined on a war with Mexico and being fully aware of the importance to the United States of an extension of territory to the Pacific, resolved to take possession of California, so that after the termination of the war this country would become a part of the Union. At all events, Fremont, while engaged in conducting a scientific expedition on the Pacific Coast, received, in May, 1846, verbal instructions from an officer dispatched from Washington. He at once turned back, made his way to Sutter's Fort, then to Sonoma, where he organized a battalion of mounted riflemen, and prepared to make war against the Mexicans. On the 14th of June, 1846, a party of Americans took possession of the town of Sonoma and raised the Bear Flag. On the 5th of July following, this Bear Flag party declared their independence, made Fremont governor and issued a formal declaration of war. Two days afterwards Commodore Sloat, under orders from the United States government, seized Monterey, and Captain Montgomery raised the American flag in San Francisco. The conquest was completed by Commodore Stockton and General Kearny. By the treaty with Mexico in 1848, California became American territory, and another milestone was reached in its progress.

Upon the acquisition of California the United States revenue laws were extended over the territory and San Francisco made a port of entry, but no further progress was made toward creating a government. The discussion as to what should be done with California when acquired began in Congress in 1846, and the question of slavery or no slavery was at once raised. When it became American territory the question of its admission into the Union was counted as one of supreme importance. There were fifteen free states and fifteen slave states, and, of course, an equal representation in the Senate. The addition of the sixteenth free state would turn the scale and mark the beginning of a preponderance of free-state power in Congress. Against this, resistance on the part of the South was almost desperate. A furious conflict was waged between the oratorical giants of Congress, but nothing concluded.

The dilatoriness was most harassing to the Californians, who soon realized that a state organization was the only feasible scheme which promised the country a government. In accordance with this conviction the people, in September, 1849, framed a constitution which forbade slavery. On the 9th of September of the following year, 1850, and without having gone through any novitiate as a territory, California sprang into full being as a commonwealth and was admitted to the sisterhood of states.

An important era dates from the discovery of gold at Sutter's mill, on January 24, 1848. The news that gold had been found sped to the most distant parts of the world. A great tide of mi-

gration swept westward, and the vast Pacific was covered with the sailing craft of all nations. The mighty historic body of gold-seekers—the Argonauts—arrived in 1849. Many of these journeyed with ox team across the plains and struggled through the Sierra, braving the famine and horror of the desert and the perils of predatory Indians. Women and children shared with men the privations of the terrible overland trail. Simultaneously with the coming of the overland contingent, ships were fitted out for the long voyage around Cape Horn, and steamers were put on to carry people by way of Panama. The majority of the newcomers were young, unmarried men of brawn and vigor, contemptuous of obstacles and reckless of their lives. They had the qualities which made them fit to do battle with and to overcome wild man and nature. They came with one idea—to get rich quickly and return home. The scramble for gold lasted until the mountains and gulches had been scratched over and a decline in gold production had set in. Then those who came to mine remained to till. The pick and the shovel gave way to the plow and the hoe. Instead of golden nuggets, the earth was made to yield a harvest of golden grain. This was the beginning of the great wheat-planting era, before the versatility of California's soil was realized. The completion of the transcontinental railroad in 1869 furthered the prosperity of the State and gave an impetus to the immigration of home-builders.

California's second "gold" discovery—the navel orange—dates from the seventies. Like Marshall's find, it was the magnet to draw to the State thousands of strangers. These, unlike the first-comers, were colonists who brought with them their household gods and set up homes, laid out orange groves, and awaited results.

The orange was the incentive to other horticultural discoveries, and today California has no equal among the states, nor indeed, among the countries of the world, in horticultural possibilities. It has more acres in grapes than New England has in corn, and it produces more wine than all the rest of the Union put together. Its beet sugar is a formidable rival to the cane product of tropic lands. It exports raisins to Spain, prunes to Germany and France, and will very soon take the fig trade of the world from Smyrna.

California, with a coast line about one-fifth the total coast line of the United States, has, by value, one-fourteenth of the fisheries; it has the densest forests of merchantable timber in the world; its yearly gold output is up in the millions of dollars, and its oil wells now exceed and bid fair to outlast the productiveness of those of Pennsylvania.

In comparison with the other states in the Union, California ranks second in area, twenty-first in population, and eighteenth in order of admission. Its coast line, measured in all its sinuosities, is nearly one thousand miles in length, and its eastern boundary conforms to the curve of the seacoast, so that its breadth is approximately the same throughout, averaging about two hundred miles. The total land area is 155,980 square miles.

THE MEADOWS, YOSEMITE VALLEY.

To give a category of the State's resources and advantages would be an endless task. In his addresses to the people of California, in 1903, President Roosevelt said:

"'The Golden State' has a future of even brighter promise than most of her older sisters, and yet the future is bright for all of us. * * * In the century that is opening, the commerce and the command of the Pacific will be factors of incalculable moment in the world's history. * * * In the South Seas the great commonwealth of Australia has sprung into being. Japan, shaking off the lethargy of centuries, has taken her rank among civilized modern powers * * * and European nations have seated themselves along the coast of China. Meanwhile our own mighty republic has stretched from the Atlantic to the Pacific, and now in California, Oregon, Washington; in Alaska, Hawaii and the Philippines, holds an extent of coast line which makes it of necessity a power of the first class in the Pacific. America's geographical position on the Pacific is such as to insure our peaceful domination of its waters in the future if we only grasp with sufficient resolution the advantages of that position. We are taking long strides in that direction. Witness the cables we are laying down, the steamship lines we are starting—some of them already containing vessels larger than any freight carriers that have previously existed. We have taken the first steps toward digging an isthmian canal, to be under our own control; a canal which will make our Atlantic and Pacific coast lines in effect continuous, which will be of incalculable benefit to our mercantile navy, and above all to our military navy in the event of war. * * * Much of our expansion must go through the 'Golden Gate.' And inevitably, you who are seated by the Pacific must take the lead in and must profit by the growth of American influence along the coasts and among the islands of that mighty ocean, where East and West finally become one."

TOPOGRAPHICAL CONSIDERATIONS.

By J. A. FILCHER,
California Commissioner to Louisiana Purchase Exposition.

In its topography California is distinct and striking. Two ranges of mountains practically inclose a great interior basin or valley. On the east is the high Sierra range, on the summits of which snow remains all the year; on the west is the low Coast Range, which gathers snow enough occasionally during the winter months to whiten its highest points a few days at a time. These mountain ranges converge at Mount Shasta in the northern part

MOUNT SHASTA.

of the State, and again at Tehachapi in the south. The great valley lying between them is one expanse of practically level or unbroken territory, from 500 to 600 miles long and from 40 to 60 miles wide. The northern portion is drained by the Sacramento river and its tributaries, and is called the Sacramento valley. The southern portion is drained by the San Joaquin river and its tributaries, and is called the San Joaquin valley. These rivers empty into the easterly portion of San Francisco bay, and the Golden Gate is their common outlet to the sea. The eastern boundary line of the State between California and Nevada follows closely the summit of the Sierra, and on the western or California side the decline is very gradual, forming an immense watershed, embracing the gold mining region of the State, vast forests of superior commercial timber, and in the lower altitudes, where less rugged, the great Sierra foothill fruit belt.

The Coast Range consists of different spurs, and between these are valleys of greater or less dimensions that are exceedingly fertile. Among the most noted of these valleys north of San Francisco bay are Sonoma valley, Napa valley, Vaca valley, and Ukiah valley. Near Clear lake is what is known as Scott's valley, very productive, but of higher altitude. South of San Francisco bay, not counting the many small and very fertile valleys in Contra Costa and Alameda counties, are Santa Clara valley, Pajaro valley, Salinas valley, Santa Maria valley, and several other extremely rich but smaller valleys in San Luis Obispo and northern Santa Barbara counties. South of the Tehachapi range, which terminates the great San Joaquin valley, is what is commonly known as Southern California. This part of the State is more or less broken by low mountains, but the region between them and the seacoast is extensive, and this and the valleys lying between the different mountain ranges are noted for a bountiful yield of every semi-tropic and other product that has helped to make California famous.

Back of the mountains in Southern California lies the Mojave desert. On this desert, where water has been developed, plant products have proven profitable; otherwise it presents to the eye a great expanse of unbroken sterility. This desert and the mountains that are too steep for cultivation embrace about 60,000,000 acres, or three-fifths of the total area of the State, leaving about 40,000,000 acres, or two-fifths of the area of the State, that is arable. Thus is the topography of California briefly outlined.

The coast trend of the State being northwest and southeast, presents a right angle front to the Japan or equatorial current that ever comes up from the southwest to lave its shores. It is this warm current that gives California its temperate and equable climate, and it is this current that gives to the entire State, north, south, and central, the same general average temperature at points of the same altitude and the same distance from the sea.

It is the topography of California that diversifies its climate more than latitude. Mountain ranges afford different altitudes,

and altitude affects temperature. These same ranges govern air currents, and these again have a bearing on the climate. On the coast where the summer sea breezes are ever present, the temperature is greatly modified, and the atmosphere is refreshing. By reason of the cooler summers on the coast, the seasons are more backward. It is in the warmer vales on the eastern or valley side of the Coast Range, or on the sunny slopes of the Sierra foothills, above the fogs and below the snow, where the sun shines always except when the clouds are passing, and in the sheltered valleys of the south, that the earliest of California's early products are grown. The entire Sacramento and San Joaquin valleys, being sheltered from sea breezes by the Coast Range mountains, present an early field, but not so early as the foothills of the Sierra, or of the sheltered vales of Central or Southern California. These facts are mentioned as interesting to the prospective producer, since the earliest fruits and vegetables are generally the most profitable. In this connection it may be stated that a new mark (or date) for California's earliest fruits is promised by the products from the desert, not important now, but which are becoming gradually more extensive as from year to year more water is being developed.

Enough of the sea breezes blow through the Golden Gate to affect the temperature of the great interior valleys by evening, and it is this influence which gives to them the delightful characteristic of cool summer nights. While the soils of the valleys and sloping hills are generally rich in the elements that go to make plant life, in some portions the soil is richer and more productive than in others. These differences, as well as the air currents that affect the temperature, have their bearing on vegetation, and especially on the fruit of the plant, and they are subjects that have to be studied by the farmer and the horticulturist.

Temperature and soil elements affect not only production, but especially the quality of the product, and they must be considered by the producer. A luscious grape, for instance, can be grown almost anywhere below a certain altitude in California; but the grape of the warm interior would have too much sugar for a light dry table wine, while the grape of the cooler bay counties would not have sugar enough for a good raisin. Hence we must grow our dry wines in the cool bay counties and our sweet wines and raisins in the warmer interior. Dry, warm weather is essential also for successfully curing raisins, and hence Fresno and adjoining counties in the heart of the great San Joaquin valley, where soil and climate conditions are ideal, have become the great raisin center of the State. Again, with the Tokay table grape color is an essential selling quality; it is therefore important to plant these grapes where there is plenty of iron or coloring matter in the soil. This is also true of peaches. For this reason the red iron soil of the Sierra foothills region is commanding attention as the field for the production of the best of these products.

These are instances, but they serve to suggest caution in the

selection of locality for any particular production. Prunes grow to large size and are generally successful throughout the great interior orchard sections of the State; but the best prunes, those which in thinness of skin, size of pit, texture of flesh, and delicacy of flavor come nearest the ideal, are grown in the valleys of the Coast Range. Thus, Santa Clara valley enjoys more fame from its prunes than has the county by reason of its possession of the Lick Observatory or the Stanford University.

Again, the foothills, so well adapted to peaches, table grapes, pears and certain varieties of plums, are not the best place for apricots. This fruit requires a deep, rich loam, and hence the river bottom land of the interior valleys and the deep, dark soil of the Coast Range valleys and around San Francisco bay can be depended on for the thriftiest trees and the best crops. Citrus fruits require a deep, rich soil and a congenial climate, warm in the summer and not too cold in the winter. The winter in San Francisco would not hurt an orange tree, yet the summer is too cool for the proper development of the fruit; hence San Francisco and adjacent coast country are not properly within the California citrus belt.

Nearly all the arable regions of Southern California have conditions favorable to citrus fruit production, and it is here nearly all the oranges and lemons are at present grown, yet the Sierra foothills and the San Joaquin and Sacramento valleys, where soil conditions are favorable, are extending their groves and adding each year to their output of this staple California fruit.

It is said the olive will grow anywhere, even on impoverished soil, but experience has shown that, like all other fruit, it appreciates good soil, and responds generously to good care.

There is much in soil and temperature in California and the adaptability of certain conditions for the best results in certain lines of products which the oldest or wisest inhabitant has not yet satisfactorily solved; but enough is known, as the result of extensive and expensive experiments, to suggest to the novice, or the newcomer, that he must exercise care in selecting a location for the pursuit of any particular line of husbandry. He may do fairly well in almost any line, almost anywhere, but what he should endeavor to learn is the locality in which he can do better in his particular line than he could do elsewhere. Ask questions, observe what others are doing, and make comparisons—this is the quickest, easiest and safest way to learn the truth.

CLIMATE OF CALIFORNIA.

By N. P. CHIPMAN,
President of the State Board of Trade.

California must be counted among the most valuable possessions of the United States for many reasons; chiefly, however, because of the matchless climate of the State and the high economic value it bestows upon a large area of arable land whose coast line measures 850 miles from point to point, the average width of the State being about 200 miles. The south boundary line of latitude emerges on the Atlantic coast near Savannah, Georgia, and the north parallel near Boston, Massachusetts. Between these two latter points lie ten states of the Union. It counts for something to the nation that this extended coast line, on the Pacific Ocean, is fortressed by a region capable of supporting many millions of people and that the coast to the Canadian boundary is backed by a country of almost boundless resources.

It is not generally appreciated that all of France, all of Italy north of Rome, and half of Spain lie *north of the north boundary of California*. This relative position on the west coast of our continent would suggest a mild climate, but not necessarily its unique and exceptional character. It is the purpose of the writer to bring to public attention the principal features of this climate and to show its economic value.

Professor Alexander G. McAdie, District Forecaster of the United States Weather Bureau, San Francisco, states that the climate of California is controlled by four great factors: (1) The movements of the great continental and oceanic pressure areas (commonly called "high" and "low"), together with the movements of individual pressure areas; (2) the prevailing drift of the atmosphere in temperate latitudes from west to east; (3) the proximity of the Pacific Ocean, with a mean annual temperature near the coast line of 55 degrees Fahrenheit, a great natural conservator of heat, to which is chiefly due the moderate range of temperature along the coast from San Diego even to Tatoosh island (extreme northwest coast of Washington); and, (4) the exceedingly diversified topography for a distance of 200 miles from the coast inland. To this diversified topography is due the fact that California is a land of many climates, "from the hottest subtropical to the cold temperate, and from the driest desert to the most humid regions of the higher mountains and northern coast."

The Sierra Nevada mountains form a natural boundary line on the east, rising gradually from the west to a height of from 8,500 to 14,000 feet, much above the snow line, and falling off to the Nevada plateau, which is about 4,000 feet above sea level. The

Coast Range mountains form a broad belt, traversing the entire coast, and consist of two or three parallel ranges from 3,200 to 5,000 feet high, and between these ranges are many rich valleys, some of large extent. The Coast Range merges into the Siskiyou mountains on the north, a connecting link with the Sierra, crowned by Mount Shasta; and the Tehachapi mountains, far to the south, form another connecting link.

Between the Sierra and the coast mountains and these connecting mountain links lies the Great Central Valley of California, about 400 miles long and from 50 to 60 miles wide; an agricultural district of great fruitfulness, comprising quite one-ninth of the State. There is but little waste land in it. The northern portion is blessed by ample rainfall, and the southern part, when watered, is everywhere very productive, as is the entire valley. The Sacramento river runs south through the northern portion (Sacramento valley), rising near Mount Shasta; the San Joaquin river runs north through the southern portion (San Joaquin valley); the two rivers uniting near the middle of the great valley and flowing westward into San Francisco bay, and thence through the "Golden Gate" into the Pacific Ocean.

There is here a wide break in the Coast Range through which the summer trade winds find their way into the interior, an important factor in the climatic conditions of the valley. This sea breeze every summer afternoon blows up stream, north into the Sacramento valley and south into the San Joaquin valley, thus tempering the heat of the great valley. This influence, together with the dryness of the atmosphere, renders the occasional high temperatures of these two valleys more easily endurable at 110 degrees than is 95 degrees in the humid regions of the Eastern States.

South of the Tehachapi mountains the Sierra continue at less elevation, and are locally called Sierra Madre. The wonderfully developed region known as Southern California lies west. On the east is the Mojave desert, and south and east the Colorado desert; important regions of the State as yet but partially developed, but of great fertility by the application of water, which the genius and enterprise of the people will surely bring in touch with the land. As in the north, the breaks in the Coast Range and in the Sierra Madre become important factors in modifying the climate of the interior. In Southern California and in Central California (San Joaquin valley) extensive irrigation systems already in operation greatly mitigate, if they do not satisfactorily supply, the lack of rainfall. Irrigation is also being much resorted to in the Sacramento valley.

Winds. The prevailing winds come from the ocean and are principally from the southwest landward, producing a cool summer climate along the immediate coast. Fogs sometimes sweep in from the ocean, more or less unfavorably affecting the enjoyment of the climate, but by their moisture contributing to the growth of vegetation. These fogs are less harsh

on the south coast. The heat rising from the great valley draws a strong current from the trade winds through the Golden Gate that divides as it passes and extends south to the Tehachapi mountains and north to Mount Shasta, rendering the air of the valley more delightful. The same drift of the trade winds tempers the air far into the interior in Southern California. The high mountain barrier on the east, through the length of the State, deflects the cold winds that sweep down over the Nevada plains in winter from Alaska and prevents their entrance into the valley regions of California. Dry north winds sometimes blow through the great valley in summer, raising the temperature, and are occasionally injurious to growing crops, but they seldom continue more than three or four days, when they are succeeded by the balmy and cool ocean breezes. Along the immediate coast the average winter and summer temperature differs only about four degrees, and one of the characteristic features of the San Francisco climate is exemplified by the sight of furs worn by ladies over summer garments, and fires in summer are not infrequent.

All along the coast, however, there are thousands of sheltered nooks and small valleys and sequestered spots, where the fogs and harsh winds of the coast have no appreciable effect and where the climate is charming and sunny to the last degree, both winter and summer.

Rainfall.

The terms "winter" and "summer," as commonly used in the Eastern States, have no application in California. The year is more properly divided into "rainy season" (winter) and "dry season" (summer). Practically all the rain falls from about the first of November until April; the remaining months of the year are rainless, except in some parts of the mountains and on the coast north of Cape Mendocino, where occasional summer showers occur. Cereal crops mature in early summer after rain ceases, and no housing of crops is necessary for protection against rain in harvest time.

The rainfall of California is a characteristic feature of the climate. A word as to its source and cause will be interesting. Professor McAdie points out that over the North Pacific Ocean in winter there exists an area of low barometer (latitudes 40 and 60 degrees north and 130 degrees west to 140 degrees east longitude), while an area of high pressure overlies the greater part of North America with a southwest extension to the Tropics and west to the one hundred and sixtieth meridian. He says: "We shall find that typical wet winters on the California coast occur when this great North Pacific low extends well eastward overlying the continent west of a line drawn from San Francisco to Calgary (Canada). At the same time the great continental high area apparently recedes to the southeast. On the other hand, the pressure distribution characteristic of a dry winter on the California coast is marked by the prevalence of the continental high over the entire country west of the Rocky mountains."

Our winter rain storms (barring an occasional one coming in

from the ocean unheralded) have their origin off the coast of Vancouver, and curiously enough are attended in the great valley by *south* winds. The storms diminish in intensity as they travel south, tapering off as they approach Southern California. The table will show this graphically, from which will be seen also the great variations of rainfall within the State, and even within the great valley. In 1903, for example, the rainfall at Eureka, Humboldt county, on the immediate coast, was 47.90 inches, and at San Diego but 6.09 inches. At Crescent City, Del Norte county, adjoining Humboldt (farther north), the rainfall reached 80.76 inches. At Redding, Shasta county (interior), the rainfall was 45.83 inches; at Red Bluff, forty miles south, 22.93 inches; at Sacramento, 14.70 inches; Fresno (center of San Joaquin valley), 6.19 inches; Bakersfield (extreme southern point of valley), 3.67 inches. In the Sierra Nevada mountains the rainfall increases about one inch for every one hundred feet elevation.

The direction of the coast valleys exerts striking influence upon rainfall and temperature, dependent upon the facility for the trade winds to reach them. The climatic and agricultural character of the foothills, up to 2,000 or 2,500 feet, is much the same as in the valley. Even higher fine deciduous fruits are grown. Still higher are the lumbering camps, mining, and thousands of cattle and sheep are herded in summer, where in winter the mountains are deeply covered with snow. Illustrative of the characteristic variations of climate it may be stated that in the vicinity of Truckee, Nevada county, elevation 5,819 feet, the temperature (February 13th) was 28 degrees below zero and the snowfall for the year was 130 inches. At Rocklin, Placer county, thirty miles west, elevation 249 feet, the lowest temperature was 28 degrees above. All the natural ice consumed in California was made near Truckee while oranges were being gathered for market around Rocklin.

Temperature. I have prepared the following table from the "Annual Summary, California section, of the Weather Bureau," for 1903. It shows not only temperature of points, but also rainfall, elevation of points above the sea, clear and cloudy days. I have taken illustrative points in Northern and Central California, the coast country and the mountains. It will be noted that while the annual mean temperature of the Pacific Coast does not differ greatly from the annual mean of the Atlantic Coast, the average summer and average winter here and on the Atlantic are wide apart, and the extremes between the highest and lowest temperature are very great. It is this exemption from extremes of temperature that constitutes the charm, and healthfulness as well, of the Pacific Coast.

In the interior, especially in the great valley, the seasons show greater extremes of temperature, but, as already suggested, the dryness of the air renders these extremes less felt than on the coast where the air is more moist. The limit of winter cold is the test of what may be grown rather than the average temperature.

CLIMATOLOGICAL DATA FOR 1903.

Station.	County.	Elevation, feet.	Temperature. (degrees Fahrenheit.)			Precipitation. (inches)		No. rainy days.	Sky.			Region of the State.
			Annual Mean.	Highest.	Lowest.	Total rain fall	Total snow fall		Clear days.	Partly cloudy days.	Cloudy days.	
Auburn	Placer	1,360	63.0	101	26	35.82	.....	41	222	81	62	Northern.
Chico	Butte	193	61.2	106	20	22.76	.....	44	187	88	90	
Corning	Tehama	277	62.6	106	30	18.28	.....	36	240	18	107	
Marysville	Yuba	67	60.9	109	27	19.48	.....	41	217	67	81	
Napa	Napa	60	57.5	108	26	18.60	.....	48	223	75	67	
Oroville	Butte	188	60.1	108	23	24.14	.....	45	207	38	120	
Placerville	El Dorado	1,820	54.2	98	16	38.60	.....	60	258	17	90	
Red Bluff	Tehama	307	61.5	108	27	22.93	.....	61	232	72	61	
Rocklin	Placer	249	62.0	105	28	27.76	.....	46	267	27	71	
Sacramento	Sacramento	71	59.4	102	29	14.70	.....	51	206	82	77	
San José	Santa Clara	95	58.3	100	25	11.29	....	42	.....	.....	.....	
Vacaville	Solano	175	60.5	109	27	21.27	.....	51	231	111	23	
Willows	Glenn	136	60.3	104	25	16.81	.....	36	203	85	77	
Woodland	Yolo	63	59.8	100	26	12.39	.....	32	236	54	75	
Bakersfield	Kern	404	61.7	109	21	3.67	.....	24	271	62	32	Central.
Fresno	Fresno	293	62.2	108	25	6.19	.....	41	238	52	75	
Porterville	Tulare	461	62.4	107	24	5.79	.....	36	217	103	45	
Stockton	San Joaquin	23	58.1	103	24	15.16	.....	46	275	34	56	
Eureka	Humboldt	64	51.8	85	28	47.90	.....	117	99	105	161	Coast
San Francisco	San Francisco	155	55.3	96	37	18.33	.....	57	178	108	79	
San L. Obispo	San L. Obispo	201	58.5	98	26	14.31	.....	37	246	64	55	
Santa Barbara	Santa Barbara	130	60.2	95	32	13.06	.....	27	169	137	59	
Santa Cruz	Santa Cruz	18	55.5	100	22	29.22	.....	38	288	22	55	
Suisun	Solano	20	58.3	109	28	14.66	.....	42	215	71	79	
Watsonville	Santa Cruz	23	58.4	95	24	17.28	.....	39	151	124	90	
Boca	Nevada	5,531	40.1	88	—30	10.82	102.0	18	269	13	83	Mountain.
Bodie	Mono	8,248	35.8	85	—36	7.34	61.5	26	156	127	82	
Greenville	Plumas	3,600	.....	103	—11	35.99	78.5	63	237	47	81	
Independence	Inyo	3,907	59.1	99	14	1.95	3.3	12	218	81	66	
Laporte	Plumas	5,000	46.2	87	10	77.04	211.3	76	217	93	55	
Quincy	Plumas	3,400	48.0	92	—9	40.60	73.0	55	214	86	65	
Sisson	Siskiyou	3,555	49.5	101	2	33.86	66.0	60	235	0	130	
Summit	Placer	7,017	42.3	80	—8	40.50	294.0	52	276	0	89	
Susanville	Lassen	4,195	46.4	93	—11	15.14	65.0	59	174	163	28	
Tehachapi	Kern	3,964	55.2	91	0	5.85	24.0	17	242	3	120	
Truckee	Nevada	5,819	43.4	94	—28	27.69	130.0	37	237	0	128	
Anaheim	Orange	134	66.6	101	29	14.32	.....	25	145	90	130	Southern.
Imperial	San Diego	—65	74.6	124	26	.34	.....	3	268	87	10	
Los Angeles	Los Angeles	293	62.2	97	32	14.77	.....	30	148	168	49	
Redlands	S. Bernardino	1,352	63.3	108	25	13.60	.....	44	242	62	61	
Riverside	Riverside	851	61.4	105	24	10.43	.....	31	249	68	48	
S. Bernardino	S. Bernardino	1,054	62.6	110	22	14.12	.....	41	222	95	48	

And so we find citrus fruit flourishing from the north to the south end of the great valley, and orange-growing is a leading industry in several counties of that valley. In Southern California both

the heat and the cold are comparatively milder, although the readings of the thermometer do not much differ from points north of the Tehachapi. It is shown by the table that there were 178 clear days in San Francisco as against 148 in Los Angeles, during the year, although there were nearly twice as many rainy days in San Francisco. For abundant sunshine, resort must be had to the interior. For example, Red Bluff, in the north, had 232 clear days and Riverside, in the south, 249. In truth, the California of "Sunshine, Fruit and Flowers" is pretty near the whole State, below high mountain elevations.

Climate Unchanging.

As far back as we have any recorded history, and behind this, embracing traditions coming through the early Mission Fathers, we learn of the same equability of temperature, the same balmy atmosphere, the same luxuriance of vegetation. Our soil may require renewing by fertilization, but our climate is as constant as the sun. The conditions which have produced the result are themselves unchanging, and so must be the result.

It is Health-Giving.

California is a universal sanitarium. The climate of the coast is invigorating, stimulating and delightful, neither hot nor cold; the laborer knows no fatigue except from physical exhaustion resulting from overtaxed muscles. The brain-worker yields only to failure of mental powers. In the interior valleys, in midsummer, the temperature is higher, and there is discomfort at times while working in the harvest fields and at the desk and behind the counter. But the dryness of the air robs the thermometer of much of its terror. The *sensible* temperature, *i. e.*, the temperature we in fact experience or *feel* in the valleys, is less irksome at 100 or 110 degrees than in regions of greater humidity of the atmosphere where the reading is from 85 to 95 degrees. Sunstroke here is unknown. It is the common experience of persons coming into almost any part of the State that they increase in weight and strength, are less troubled with nervous affections, sleep and eat well, and improve in health if ailing from any cause.

Source of Happiness.

The variety of temperature and climatic conditions existing in the mountains, valleys and on the coast, and the celerity and ease with which our inhabitants may change their immediate surroundings, constitute one of the great charms of California life. Thousands of families residing in the valleys find their way into the mountains or to the seacoast and have most delightful camping-out experiences; and this they may do in a few hours or a day or two at most, with their own conveyances. Our valleys and mountains lie so related to each other that no spot can be found devoid of scenic beauty. There is no dull monotony in the farmer's life as there is from necessity in the lives of those who reside on the great plain regions of the West, few of whom are ever permitted to enjoy the inspiring and elevating means of recreation and rest from labor which are a part of our life here.

Some Peculiarities. Degrees of latitude cut little figure in determining the readings of the thermometer, which is not at all true on the Atlantic Coast and in the West. The above table tells the story from official sources for 1903, and is valuable as covering the whole distance and intermediate points, from San Diego near the south line of the State to Redding at the extreme north end of the Sacramento valley—eight degrees of latitude apart.

The fact that latitude has little to do with our climate is a remarkable feature. It is not true of Italy, for there is a great variation there between the temperature north and south. It is not true of France or elsewhere along the west coast of Europe. We believe this to be a peculiarity unique and found only on this coast. This peculiarity is further attested by the fact that in all this vast region the same fruits are grown. Within a radius of fifty miles around Oroville, which is 150 miles north of San Francisco and 650 miles north of Los Angeles, there were more than one thousand carloads of oranges raised last year and shipped out of the State, and they ripen earlier than in the south. Elevation has much more to do with temperature than latitude, for in high altitudes we find snow. Our mountain summer climate is extremely delightful and is destined to draw many Eastern people to the numerous charming retreats in the Sierra and the Coast Range.

Economic Value. But after all is said, it must be conceded that climate is our greatest resource because of its high economic value. The unthinking speak of climate as an attraction rather than a resource, but it is a resource because by its influence we are enabled to so marvelously diversify and increase the number of our agricultural products; and often, too, all these products may be grown on the same body of land. It is a resource, because man's labor here can be profitably employed every day in the year; because there is no month when vegetation in some form is not growing, and because it furnishes ideal conditions for the growth of irrigated crops. There is no time when all nature is at rest or plant life is sleeping. In the field, orchard, garden, factory, and in the mines; on the stock farm and in the dairy, *every day* is a day of *productive labor*. We commence shipping fresh deciduous fruits in May and there is no cessation until December. In November we begin to ship citrus fruits and they overlap the deciduous fruits and continue in fact the year through.

Professor E. W. Hilgard justly sums up the matter thus: "Taken as a whole, California corresponds in its climatic features and adaptation to the Mediterranean region of Europe and Africa—a grand *Riviera,* with a partial background of the desert as well, where the date palm and the ostrich find a congenial home, and alluvial plains equaling in richness the famed delta of the Nile."

THE TRIUMPH OF IRRIGATION.

By WILLIAM E. SMYTHE,
Author of "The Conquest of Arid America."

First of all, irrigation is not a substitute for rain. Rain is a substitute for irrigation, and a very poor one. Irrigation is an insurance policy on the crops. But it is far more. Irrigation is the mother of institutions!

An ideal place would be one where it never rains in the growing season, but where the genius of man, working in co-operation with favorable natural conditions, could direct the moisture just where and when it is needed, in accordance with the varying needs of different crops. This ideal condition is approximated in a large part of the arid region, including the major portion of California.

The most striking effect of this ancient art, which has now become the inspiration of remarkable modern developments, is its social influence. In this respect it revolutionizes the character of rural life. For irrigation means small farms; small farms mean near neighbors; and near neighbors imply high social advantages. The best examples of irrigation communities combine the most attractive features of town and country life. They give at the same time the benefits of neighborhood association and the independence that comes from living on the soil. The result is a high degree of equality such as is seldom realized elsewhere. In many a California colony the homes are as beautiful as in the famous suburbs of Boston and Philadelphia, and these beautiful homes belong to the many, while those in the suburbs of great Eastern cities represent the few who have succeeded better than the average.

Irrigation is the great teacher of co-operation. Men are compelled to associate and organize in distributing water over their lands. From this experience it is easy to go forward to similar association in the sale of their products and the purchase of their supplies. For they soon learn that it is better to work with and for each other than against each other. This form of economic development is yet in its infancy, but is destined to extend in all directions and to have a very important influence on the future civilization of the irrigated region.

The artificial control of moisture supplies the basis of absolutely scientific agriculture. The element of chance is wholly eliminated. Man asserts his control over the forces of nature. Among other desirable results, he gains the power of diversifying his crops to the utmost degree and thus becoming self-sufficient. With him, the rain does not fall upon the just and the unjust—that is to say, upon crops that need it and crops that do not need

AN IRRIGATING CANAL—ORANGE GROVES AT THE LEFT.

it. The strawberry vines may call for moisture in their own unmistakable language, and the call is promptly answered. The sugar-beets may crave only the uninterrupted sunshine in order that they may pack the largest possible amount of saccharine matter in their tiny cells, and the water is allowed to go singing past them. Thus, individuals and communities may become independent. National prosperity may pass and hard times come in its place, but the man who has a few acres of irrigated soil will continue to collect his living so long as water runs down hill and Mother Earth yields her increase.

The most famous spots in California were evoked from desert or sheep-pasture by the miracle of irrigation. It does not follow that all parts of the State are worthless for agriculture or horticulture without it. But it is true, as Major John W. Powell said years ago, that "there is probably no acre of land in the United States the productive capacity of which would not be at least doubled by scientific irrigation." This is emphatically true of California, and the industry is being gradually extended into many localities which once proudly advertised that "no irrigation is needed."

How Water Is Put Upon The Land.

To those who are unfamiliar with it the actual process of irrigation seems a deep mystery. They regard it as an effort to overturn the laws of nature. The truth is that it is a perfectly natural process. The man who waters his plat of grass, and the woman who waters her dooryard pansies, are irrigators in a humble way. The citizen who grumbles at the sight of withered lawns in a public park during a dry summer yearns for irrigation without knowing it.

The control of water for irrigation presents about the same problems to the engineer as the control of water for domestic purposes in large cities and towns. The water must be diverted from a flowing stream at a level high enough to command the territory to be irrigated; or it must be impounded in reservoirs at a season of floods or unusual flow, such as occurs everywhere when the ice and snow are melting; or it must be sought in the bowels of the earth by means of wells and lifted to the surface by pumps, except in the case of artesian waters, which flow out of the mouth of the well by reason of their own pressure.

The principal difference between securing a supply for domestic and for agricultural purposes is that in the case of the former the water must be as pure as possible, while in the case of the latter the impurities which gather in ponds and streams have a distinct commercial value as fertilizers. The sewage of Paris is used for irrigation purposes with wonderful results, and the same thing is done in several Western cities, including Los Angeles.

Irrigation works range from rude and simple ditches, taking their supplies from mountain brooks where the water has been diverted by means of small brush dams, to great masonry walls which block the outlet of deep canyons, holding back the water,

which is thence transported through pipes, flumes and cemented ditches to rich lands miles away. In the one case the works have been constructed by a small association of farmers, using their own labor and teams; in the other, millions of Eastern and foreign capital have been invested. In both cases water is led through main canals to central points in the territory to be reclaimed. These mains are of all sizes, depending entirely upon the volume of water required. From the mains lateral ditches reach out in various directions. The farmer taps the lateral with a shallow ditch, usually made with a plow, and thus conducts the water where he wants it through his own private system of distributers. The management of the water, when the system has once been perfected, is so simple that a child can attend to it.

In the hands of the Indians and Mexicans of the southwest irrigation was a stagnant art, but the white population studied it with the same enthusiasm it bestowed upon electricity and new mining processes. The lower races merely knew that if crops were expected to grow on dry land they must be artifically watered. They proceeded to pour on the water by the rudest method. The Anglo-Saxon demanded to know why crops required water, and when it could be best supplied to meet their diverse needs.

The earliest method of irrigation is known as "flooding," and is usually applied by means of shallow basins. A plot of ground near the river or ditch from which water is to be drawn is inclosed by low embankments called checks. These checks are multiplied until the whole field is covered. The water is then drawn to the highest basin, permitted to stand until the land is thoroughly soaked, and then drawn off by way of a small gate into the next basin. This process is repeated until the entire field is irrigated. This is the system practiced on the Nile, where the basins sometimes cover several square miles each, while in the West they are often no more than four hundred feet square.

There is both a crude and a skillful way to accomplish the operation of flooding, and there is a wide difference in the results obtained by the two methods. Indian and Mexican irrigators seldom attempt to grade the surface of the ground. They permit water to remain in stagnant pools where there are depressions, while high places stand out as dusty islands for generations. All except very sandy soils bake in the hot sunshine after being flooded, and the crude way to remedy the matter is to turn on more water. Water in excess is an injury, and both the soil and the crops resent this method of treatment.

The skillful irrigator grades the soil to an even slope of about one inch to every hundred inches, filling depressions and leveling high places. He "rushes" the water over the plot as rapidly as possible and, when the ground has dried sufficiently, cultivates the soil thoroughly, thus allowing the air to penetrate it. The best irrigators have abandoned the check system altogether and invented better methods of flooding the crops. Cereals and grasses must always be irrigated by flooding, but the check system seems

likely to remain only in localities where Spanish speech and traditions survive. Flooding is now more generally accomplished by means of shallow indentations or creases, which are not as large as furrows, but serve the same purpose. These are made by a simple implement at intervals of about twelve inches. They effect a very thorough and even wetting of the ground.

The Most Scientific Way.

The scientific side of irrigation is to be studied in connection with the cultivation of fruits and vegetables rather than with field crops. It is here that the English-speaking irrigators of California produced their best results. The ideal climatic conditions attracted both wealth and intelligence into the irrigation

IRRIGATING DITCH—LINED WITH CEMENT.

industry. Scarcity of water and high land values promoted the study of the best methods. Where water is abundant it is carried in open ditches and little thought is given to loss by seepage and evaporation. Under such conditions water is lavishly used, frequently to the injury rather than to the benefit of crops. But there are parts of California where water is as gold and is sought for in mountain tunnels and in the beds of streams. A thing so dearly obtained is not to be carelessly wasted before it reaches the place of use. Hence, steep and narrow ditches cemented on the bottom, or steel pipes and wooden flumes, are employed.

The precious water is applied to the soil by means of small furrows run between the trees or rows of vegetables. The ground has first been evenly graded on the face of each slope. The aim

of the skillful irrigator is to allow the water to saturate the ground evenly in each direction, so as to reach the roots of the tree or plant. The stream is small, and creeps slowly down the furrow to the end of the orchard, where any surplus is absorbed by a strip of alfalfa, acting like a sponge. The land is kept thoroughly cultivated. In the best orchards no weed or spear of grass is ever seen, for water is too costly to waste in the nourishment of weeds. Moreover, it is desired to leave the soil open to the action of air and sunshine. Nowhere in the world is so much care given to the aeration of the soil as in the irrigated orchards and gardens of California. Too much water reduces the temperature of the soil, sometimes develops hardpan and, more frequently, brings alkali to

IRRIGATING PRUNE ORCHARD—TREES IN BLOOM.

the surface. For these reasons, modern science has enforced the economical use of water, reversing the Mexican custom of prodigal wastefulness.

Of late years the application of water by furrows has been brought to a marvelous degree of perfection. What is known as the "Redlands system" is the best type of irrigation method known in the world. Under this system a small wooden flume or box is placed at head of the orchard. An opening is made opposite each furrow and through this the water flows in the desired quantity, being operated by a small gate or slide. The aperture regulates the flow of water accurately and the system is so simple that, after it is once adjusted, it is as easy as the turning of a faucet. The farmer who grows his crops on a fertile soil, under

almost cloudless skies, with a system controlling the moisture as effective as this, may be said to have mastered the forces of nature.

The quality of the fruit has improved immensely since the California methods were perfected. Every fruit-grower realizes that the profit in his business comes mostly from the first grade of fruit. Scientific irrigation makes it possible for him largely to increase the percentage of the best fruit, and the difference which this produces in the earning capacity of his acres is surprising.

The Field of Operations.

The Mission Fathers gave the natives their first lessons in the art of irrigation, and the beautiful gardens and orchards which sprang up in the early religious communities illustrated the agricultural possibilities inherent in California soil and sunshine. But the modern era of

FLOODING THE ORCHARD—WATER-TENDER AT WORK.

irrigation began fifty years ago with the founding of Anaheim, some twenty miles southeast of Los Angeles, by a colony of German-Americans. Anaheim is rightfully proud of its distinction as the mother colony.

Far more widely celebrated, however, are Riverside and the numerous settlements which came into being as the consequence of its example and influence. Among these are Ontario, Pomona, Etiwanda, Corona, Redlands and many others. These famous communities represent the maximum achievement in home-building on irrigated lands, and have no real rivals in any part of the world, so far as skill in the application of water and beauty of public and private improvements are concerned. All that was said at the beginning of this article about the peculiar social and economic

advantages arising from scientific control of moisture is strikingly illustrated in scores of Southern California communities.

The streams in this part of the State are wholly of torrential character, and during the larger portion of the year present nothing but dry channels over most of their courses. But during the rainy season they are often roaring rivers for a few days at a time, while a considerable flow is maintained by the melting snows much later. The canals first built upon these streams obtain most of their supply from the surface flow, but later canals depend upon the water which has been caught and held in storage reservoirs or upon that obtained from deep wells, some of which are of true artesian character and flow by means of their own pressure. The hunt for water goes on relentlessly from year to

IRRIGATING STRAWBERRIES.

year, for it is the foundation of all values in this arid land. What individuals may do alone, or small farming communities by means of co-operation, has been largely done. What is now to be accomplished by the hand of united and associated man we shall shortly see.

Although Southern California was first to utilize irrigation, this is by no means the largest field of the industry. The beautiful southern counties enjoy a fame wholly out of proportion to their geographical area, which is greatly to their credit, and which is due to their success in putting water upon the land far more than to any other single factor. But it is the region north of the Pass of Tehachapi which was endowed by nature with the greatest

valleys of fertile soil and the most abundant supplies of water available for irrigation. The climate, too, is fully equal to that of the south in productive capacity. Indeed, the earliest fruit of every kind, including oranges, is grown hundreds of miles north of Los Angeles. It is difficult to convince Eastern people that this is true, because of their inherited prejudices as to the meaning of northern and southern latitudes, but it is, nevertheless, a fact beyond all dispute.

The great interior basin of California, inclosed between the Coast Range and the Sierra, extends north and south of the bay of San Francisco for hundreds of miles in either direction. The southern portion of it, known as the San Joaquin, has a number of great irrigation systems, any one of which supplies more land than is irrigated in the famous valleys of Southern California. In addition to these great systems, there are many smaller ones. Perhaps the most striking development is that in the neighborhood of Fresno, which is the center of the raisin district. Here a very poor cattle country has been converted into a land of small diversified farms, sustaining a comparatively dense population.

The great valley of the Sacramento, constituting the northern half of the great interior basin, is even more abundantly watered so far as the natural supply is concerned, but is far more backward in irrigation development. This is due to the fact that rainfall is heavier and more reliable, so that crops are raised without artificial moisture. The Sacramento region is now in the stage of transition from large to small farms and irrigation is being rapidly extended in consequence.

In the beautiful coast region the same general statement is true, although the small farm unit has preceded irrigation in many localities. Certain classes of fruit are raised successfully by means of the winter rainfall, but the productive capacity of the soil is greatly enhanced by irrigation. Not only so, but irrigation makes it possible to diversify the crops to the last degree and to take full advantage of the wonderful climate by raising successive crops of small fruits and vegetables. This explains the rapid spread of the art in all portions of the State.

Besides the celebrated districts in the north and south, with which all travelers and readers are more or less familiar, there are undiscovered Californias lying away from the railroad lines and scarcely known to Californians themselves, yet full of potentialities of development. These are on the eastern slopes of the Sierra, bordering Oregon on the north, Nevada on the east, and Mexico on the south. The most promising of these districts are the Honey Lake region, the Inyo country and the vast valley of the Rio Colorado.

As a whole, it may be said that the irrigation industry of California is yet in its infancy. What has so far been done is little more than the foreshadowing of the great achievement which is to come, for something great has happened in the last two years.

The Awakening of Uncle Sam.

Private and small co-operative enterprises have done what they could to assist California in the realization of its economic destiny. And they have done well. But the task is too great for any power short of the General Government itself to carry to a successful conclusion. It is to be the labor not of years, but of generations, even of centuries. It is to cost not millions, but tens of millions. It is to benefit not individuals and local communities alone, but states, a nation, humanity. And its dividends are to be paid, not in pecuniary terms, but in lasting institutions, in the economic freedom of the race.

The act approved June 17, 1902—the anniversary of the battle of Bunker Hill—started California on a new era of development. The money provided for the work of national irrigation is meager—the fund now amounts to something over twenty millions—but the principle established is of incalculable importance. Already national engineers are at work in making plans on two California streams for irrigation systems as great as those built by British genius on the Ganges and the Nile. These streams are the Sacramento in the north and the Colorado in the south. When these are completed the foundations will be laid for millions of new population and hundreds of millions of new taxable wealth. These systems may be made to provide not only for irrigation, but also for drainage of lands now rendered useless by annual overflow, and may also assist in the provision of facilities for navigation and for power.

The greatest single example of the triumph of irrigation in California is seen in the big region formerly known as the Colorado desert. This is the delta of the river of that name, in the extreme southeastern part of the State, extending over the border of Mexico. Here daring private enterprise has undertaken what would have been an ideal task for the Government itself—the reclamation of something like a million acres of the most fertile land in the world.

So recently as January 1, 1901, not a single white man dwelt in the region, and even Indians were scarce. On January 1, 1902, a party of a dozen surveyors had the place to themselves. On January 1, 1903, two thousand settlers had arrived. On January 1, 1904, there were, approximately, ten thousand people there, with several towns, a railroad, telegraph, telephone, many stores, a national bank, and with seventy thousand acres in actual cultivation. It sounds like a tale from the Arabian Nights, but it is absolutely true. And even the truth of today is pale compared with the promise of tomorrow. A great river brought under human control makes all the difference between hopeless desolation and the highest forms of civilization.

California beckons to the waiting millions. By the grace of irrigation she can make room for them all, and not only make room for them, but give them a degree of social equality and economic independence such as no other land on the face of the earth was

ever able to offer them. To those who want homes, who want to work for themselves, who want to provide a future for their children, *California* spells *Opportunity.*

THE MINERAL WEALTH OF CALIFORNIA.

By LEWIS E. AUBURY,
State Mineralogist.

The world is familiar in a general way with the mineral wealth of our State, and the name of California is always associated with golden products; but while gold has in the past been the chief mineral, and will be for some time to come, there are added almost yearly new discoveries of mineral substances of economic value.

There has been a large increase in building operations in California within recent years, and with the prosperity that the State is now enjoying, it is reasonable to suppose it will continue for a long time to come. Builders and contractors have sought to avail themselves of the material within our borders, but while Nature has been kind to us and has supplied us with an abundance of raw material, man has been slow to take advantage of the gifts, and we find that instead of such material being entirely supplied at home, thousands of dollars' worth is annually imported. Notwithstanding there was $4,109,023 worth of structural materials produced in this State during the year 1902, an increase over the previous year of $1,161,748, the supply was not large enough to meet the demand.

Until recent years a large percentage of California's buildings in cities as well as towns were constructed of lumber; but as modern construction calls for fire-proof material of steel, brick and stone, there is no reason why the demand should not be supplied from sources right at home. Excellent opportunities are offered for the quarrying of granite, marble, sandstone, serpentine, slate, volcanic tufa, and other building-stones.

Limes and clays are found in deposits contiguous to one another, from which the finest Portland cement can be manufactured. At present there are three established plants manufacturing cement in the State, and the demand is such that there is need for other plants. During 1902, 171,000 barrels of cement, valued at $423,600, were produced.

With the demand which is being made for exterior building material, equally so is the necessity for supplying interior decorative material, such as marble, onyx, travertine, serpentine, etc.

California abounds in these products, and splendid opportunities exist for capital to open quarries to supply the demand.

In addition to structural material, a demand is also made for terra cotta, and pressed and glazed brick. Our very extensive clay beds, which can be found from Siskiyou to San Diego, and which are but little developed, offer desirable material to meet all requirements. In addition, many clay deposits have been found from which a superior quality of decorative pottery can be manufactured. We produced in 1902, of pottery clays, 67,933 tons, valued at $74,633; and of brick clays, 169,851 M., worth $1,306,215.

To exemplify the structural materials we produce, an arch composed of the products from our leading quarries has been erected at the entrance of the California Mines Exhibit at the St. Louis Exposition.

Iron Ores. California has large deposits of iron ores, and at present we are confronted with the problem of a supply of hard fuel for smelting this ore, and under present conditions the cost of a desirable natural coke is prohibitive in order that we can compete favorably with the Eastern market. The solving of this problem, I believe, will be met by the manufacture of an artificial coke. Experiments in a small way have been conducted with our California coal combined with petroleum and other substances, and a product has been obtained which appears to meet the demands.

We are producers of many mineral substances the raw product of which is shipped beyond our borders for reduction and refining. There is no reason for sending these away for manipulation, as better facilities for the reduction of both metallic and non-metallic substances can not be found outside of this State. With abundant electric power and the low price at which California fuel oil can be obtained, added to abundant transportation facilities by both rail and water, there should be no reason why the products of California should not be reduced in California.

To cite instances, let us consider that of copper. During the year 1902 there were produced in this State 27,860,162 pounds, of the value of $3,239,975; and for sixteen years prior to that time, 164,324,845 pounds, of the value of $23,028,312, all of which were shipped outside the State, principally in the form of matte and blister copper, to Eastern points for refining.

Of non-metallic substances there were produced of borax, covering the same period, 281,476,000 pounds, of the value of $12,693,643. This vast quantity was also largely shipped East and refined there.

Lithia Mica, or Lepidolite. A comparatively new industry which has been opened in the past five years is that of lithia mica, which is found in San Diego county. During that time, 2,486 tons were produced, of the value of $74,980, and the product of the mines was shipped to Germany and reduced, and a large portion was returned to us in the form of lithia salts and tablets.

The above are cited as three instances to show the quantity and value of these substances, and to illustrate some of the possibilities where refining could be carried on at home.

Magnesite. With the recent development of the oil industry and its large use as fuel it has been found necessary to supply some resistant material which would withstand the enormous heat developed in burning crude oils. Experiments were conducted with many different fire clays, but it has been found that among other substances, magnesite seems to meet all requirements, and on account of this there is annually imported from foreign countries a vast amount of magnesite bricks which are used principally in fireboxes where oil is burned as fuel. Deposits of a superior magnesite in almost unlimited quantities are found here, favorably situated for transportation, and thus the development of the oil industry opens an inviting field to exploit another industry, which is largely dependent upon it.

The output of magnesite in 1902 was 2,830 tons, worth $20,655. The magnesite produced, however, was used principally in chemical manufacture, and it yet remains for capital to establish a plant for the manufacture of magnesite bricks, for which there is an eager market.

Gem Industry. Owing to the prospector's greater familiarity with the precious metals his time has been mainly devoted to them. It is possible, also, that owing to his lack of knowledge of gems and their inclosing formations he has until recently overlooked a field which bids fair to be of great importance. Southern California is the locality where the greatest developments have been made in the gem industry. In the past year the new lilac gem, spodumene, which has been termed "Kunzite," was discovered near Pala, San Diego county. This was the chief gem discovery in the United States during the year 1903. Many peculiar properties are possessed by this gem, and independent of its value as a gem it is attracting the general attention of the scientific world.

In San Diego county has also been found many beautiful tourmalines, the product in 1902 amounting to $150,000. San Bernardino county produces a fine grade of turquoise, and in 1902 produced $11,600 worth of this gem. Chrysoprase is also being mined in Tulare county. New discoveries of fine rubellite and other tourmalines have been made in Riverside county. Besides the above mentioned, many diamonds of good quality have been found, principally in the gravels of the hydraulic mines.

Topaz, both white and blue, have been found also in California. Magnificent spessartite garnets have been found in San Diego county. Massive green vesuvianite, which greatly resembles jade, has been found in Siskiyou and Tulare counties. The name "Californite" has been given it.

Gems of minor importance have been found distributed over a large area, and with intelligent prospecting the gem mines of California will probably yield great returns.

Niter.

It is held by some miners and metallurgists that almost every mineral can be found in California, and while the statement is broad, discoveries of new products are constantly being made. One of the most important to the State from a commercial standpoint was the discovery of nitrate of soda in San Bernardino and Inyo counties, in the Death Valley region. Some of these deposits were discovered years ago and prior to the advent of the Santa Fe Railroad, but on account of the long distance of transportation it was found to be out of the question to work them profitably. But now that the new Salt Lake Railroad and the branches of the Santa Fe are approaching them, renewed interest will be taken, and in all probability

TWENTY-MULE TEAM HAULING BORAX.

within a short period another important industry will be added to the many which are in profitable operation now.

A rough examination of the niter deposits has disclosed the fact that in area they exceed those of Chile, but sufficient exploitation has not been carried on to determine the depth of the deposits and actual percentage that can be obtained, except in a limited number of claims. To furnish an idea of the importance of the industry, and the steadily increasing demand for niter in the United States, a few figures may not be amiss. In the year 1891 there were imported 99,663 metric tons of niter, valued at $2,579,930; for the year 1900, 185,022 tons, valued at $4,868,520; or an average value of $26.31 per ton. In considering the matter of niter production and consumption we should remember that the Chilean

fields, from which we draw our supply, are gradually being exhausted, and that our soils which need fertilization, and our power manufacturers, are making increasing demands upon those deposits. It is only a question of a short time when these demands must be met, and this State will be looked to for the necessary supply. The deposits in California offer a promising opportunity for profitable investigation.

Salt. This important commodity is at present being produced to a large extent by solar evaporation from sea water, although a portion of the product is furnished by the desert deposits, in what is known as Salton Basin. The inland deposits are of the finest quality, and so extensive that California exceeds any state in the Union in the extent and quality of its salt deposits; and as more convenient means of transportation are afforded, this industry is continually increasing in importance. To illustrate the growth of it in this State, in 1887 there were produced 28,000 tons, valued at $112,000; and in 1902, 115,208 tons, valued at $205,876; or a total production in sixteen years of 924,288 tons, valued at $2,431,452. As the constant increase of population in California and commercial requirements mean an increased demand for salt, opportunity is also here presented for investment.

Copper. Like many other of the minerals produced in California, it has been only in recent years that the copper industry has received much attention, and it was not until 1897 that the amount of production had assumed large proportions, although the history of copper mining in California dates back to the early sixties.

Copper has been found in practically every county in the State, the largest proportion of the metal produced being from Shasta county, where active development began in 1896.

The industry has grown from a production, in 1887, of 1,600,000 pounds, valued at $192,000, to 27,860,162 pounds, valued at $3,239,975, in 1902. In the year 1901, copper to the extent of $5,501,782 was mined, and for a period extending from 1887 to and including 1902, there were produced 164,324,845 pounds of copper, valued at $23,028,312.

A continuous copper belt, the longest so far discovered in the world, exists in California. But a comparatively small depth has been so far attained in the mines, and the results have been very profitable. Many excellent prospects have been discovered along this belt, but the lack of necessary capital has retarded development. A large proportion of the mines and prospects are situated convenient to railroad transportation, and abundant facilities exist for the economical mining and reduction of the ores. Copper mining is yet in its infancy in California, and while its permanency is assured, capital is needed for the proper development. While there are certain favored sections, other localities present equally good inducements, and at much lower figures than in some sections where permanent mines have been developed.

In the limited space of an article of this character it is impossible to treat this subject as it deserves, and to those desiring more particular information, the reader is referred to the "Copper Resources of California," published by the California State Mining Bureau, in which is given a full list of the copper mines and prospects in the State, together with the localities in which they are to be found, names and addresses of owners, etc.

Quicksilver. California is the only state in the Union that produces any commercial amount of quicksilver. In the year 1902, in the relative rank of minerals produced, quicksilver occupied the sixth place, with a record of 29,552 flasks, valued at $1,276,524. This mineral was mined as far back as 1850 at the New Almaden mine, in Santa Clara county, which was the sole producer until 1860, when the large demand for quicksilver caused an active interest in development.

LARGEST QUICKSILVER MINE IN THE WORLD—NEW ALMADEN.

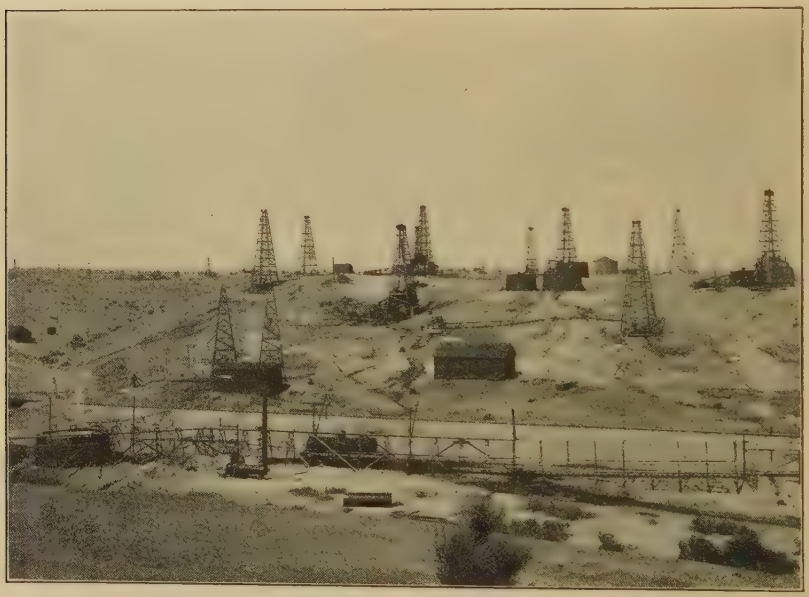
From July, 1850, to April, 1896, there were produced from New Almaden 953,018 flasks of 76½ pounds each, or 36,452.94 tons of quicksilver. From 1887 to and including 1902 there were produced from the various mines 464,529 flasks of quicksilver, valued at $19,194,773. For many years the total annual value of production has varied comparatively little.

Quicksilver has been found principally in the coast counties, and while occurrences have been noted in the Sierra Nevada range, the deposits in this range have not so far been found to be of importance. In the past three years a renewed interest has been taken in quicksilver mining, and several old mines have been reopened. Comparatively little development work has been performed on prospects, of which there are many promising ones, principally in the counties of Lake, Colusa, Napa, Sonoma, Santa Clara, San Benito, San Luis Obispo, Fresno, Monterey and Merced.

Petroleum. No mineral substance has of recent years proved of so much importance to California as petroleum. While the permanence of the oil fields was questioned at the time they were but partly developed, there is at present no doubt as to the large supply which will be available to meet all

requirements for many years to come. The oil industry is in its infancy, and the oil reservoirs have scarcely been touched—those which underlie the great San Joaquin valley, the region south of Tehachapi and the valleys of the coast counties.

The price of oil has remained for some time at a low figure, but in my opinion it will be but a short time when the producer will obtain a much better price; and while making it highly profitable to him, oil will be sold at such a figure as to allow the consumer to use it much more economically than hard fuels. California was not prepared to use such a large amount of petroleum as was so suddenly thrown upon the market. The use of oil as a fuel on this coast was new, and until it had been developed that



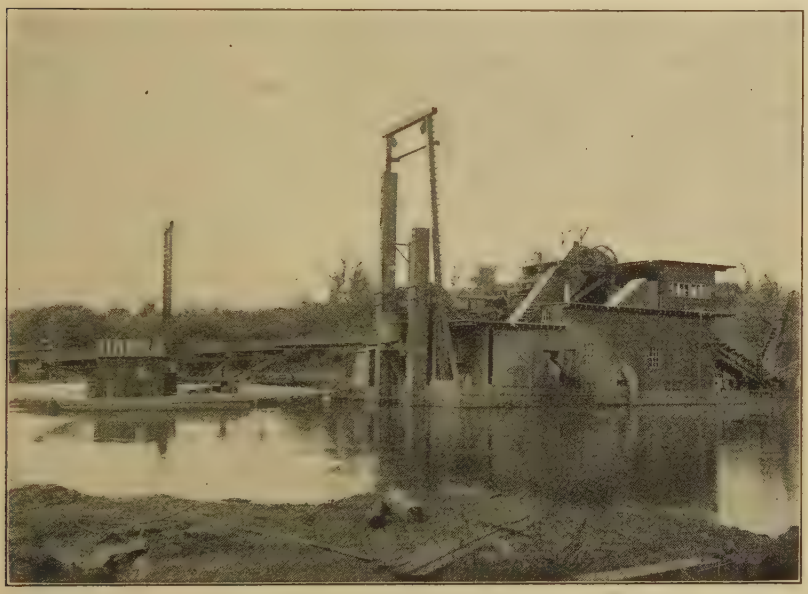
KERN RIVER OIL FIELDS.

a permanent supply was available, those requiring fuel were skeptical and were in no haste to adopt it. Now that the question of supply has been satisfactorily settled, changes have been rapidly made from hard to liquid fuel, and its manifold advantages are made apparent to the consumer.

The growth of this important industry may be shown by the production of petroleum in 1887, which was 678,572 barrels, valued at $1,357,144, and the production of 1902, which was 14,356,910 barrels, worth $4,692,189, thus giving it second place in relative value of minerals produced for that year. The total production of petroleum from 1887 to and including 1902 was 39,680,217 barrels, valued at $27,067,997.

Gold. Gold still maintains the lead in the mineral products of California. As new methods for the economical mining and reduction of gold are being introduced, the large amount of low-grade ores which in the past were not workable are now attracting the attention of investors. Electric power transmission lines have been constructed through most of the districts of Northern and Central California, thus reducing an important item of cost. Through Southern California, in most of the mining districts, crude oil is used almost exclusively, and many desert mines which would have found it impossible to operate to advantage but for a cheap liquid fuel are now being developed.

Since the anti-debris law went into effect, hydraulic mining has



GOLD DREDGING—OROVILLE.

been carried on chiefly in Northern California where the streams empty into the Pacific Ocean and not into navigable rivers. In the regions where this class of mining was formerly carried on, and where the debris law caused a cessation of hydraulic mining, drift mining is being vigorously prosecuted. These old channels extend from Siskiyou county in the north to Tuolumne county in the south—several hundred miles.

Dredging. Where the many mountain streams empty into the Sacramento and San Joaquin valleys immense quantities of gold-bearing gravel have been deposited, and in order to recover the gold, dredges of different types have been introduced, which elevate the gravel, separate the coarse material and stack it to one side, the finer gravel containing the gold being

passed over plates and riffles which recover it. The first dredge was installed at Oroville, Butte county, and the success which it met caused the employment of many others in that vicinity. Many improvements have been made, which have very materially reduced the cost of operation, until at the present time the larger dredges are able to handle the gravel at a cost approximately of 4½ cents per cubic yard. The gravel varies in value from 10 to 50 cents per cubic yard, although in some instances the latter value is exceeded. So successful were the dredging operations around Oroville that numerous companies have in the past few years commenced operations in many other localities, and dredge mining today offers one of the safest classes of investments that can be made.

The gold-bearing ores of California are mostly free milling and concentrating in character, and where this condition does not exist the ores are amenable to cyanide treatment. As stated before, many improvements have been made in the treatment of our ores, and the high percentages now saved have made it possible to work many old mines at a handsome profit, where a few years since they could not be made to yield more than expenses.

California at present yields between $16,000,000 and $17,000,000 annually in gold, and from 1848 to January 1, 1903, has yielded the immense sum of $1,379,275,408. These figures, which are official, offer more evidence of the fact that California's gold mines are still large producers than any other argument which could be submitted.

The aggregate value of the fifty-one mineral products which are listed for 1902 is $35,069,105. This amount is increasing at the average rate of about $2,000,000 yearly.

The purpose of this article has been to call attention in a general way to the opportunities for profitable investment in the various mineral products of the State; but as lack of space precludes the possibility of entering into full details of each subject, for the information of those who are interested in investments in mineral products it is stated that detailed information has been published in the reports and bulletins which have been issued by the State Mining Bureau, Ferry Building, San Francisco. Also, mineral maps of the counties, on which are shown the location of the mines and deposits. Accompanying these maps are registers (or keys), with information concerning each of the mines or deposits. The Bureau also prepares an annual statistical bulletin, which furnishes the amount of each mineral product and the county in which it is produced. The last bulletin of this nature was issued for the year 1902, the production for 1903 not yet having been compiled.

THE OIL INDUSTRY OF CALIFORNIA.

By DR. C. T. DEANE,
Secretary of the California Petroleum Miners' Association.

While for twenty-five years or more there has been general knowledge of the existence of petroleum in California, it has only been during the past five years that the great importance of its discovery has been adequately appreciated.

Development work at different points has determined the existence of a well-defined oil belt, stretching along the foothills the entire length of the State. It has been traced beyond our boundary, both north and south; spurs branch out toward the coast, and even into the ocean, as the Summerland district at Santa Barbara and the district lately developed in the northern part of Santa Barbara county.

Some of the districts now in course of development produce an oil of 30 degrees gravity, while others go as low as 140 degrees; it is all, however, valuable, even in its crude state, for either fuel or refining, and unlike Texas oil, is free from sulphur.

The production of oil during the last four years has been as follows:

1900	4,000,000	barrels
1901	8,000,000	"
1902	13,000,000	"
1903	23,000,000	"
1904	estimated over 30,000,000	"

In 1902 California was the second state in the Union in the production of crude oil. I have no doubt that at the present time she stands first.

Producing Fields.

The producing fields, beginning at the southern end of the State, are as follows: Fullerton, Puente, Whittier, Los Angeles, Newhall, Ventura, Summerland, Santa Maria or Northern Santa Barbara district, Kern River, Sunset and Midway, McKittrick, Coalinga, Santa Clara county, and Half Moon Bay. None of these fields, with perhaps the exception of Los Angeles, has as yet been brought into full production.

The greatest oil field yet developed in California, and what bids fair to prove the most prolific in the world, with perhaps the exception of Baku (Russia), is the Kern River. Here are over 4,000 acres of absolutely proven land, capable of developing on every acre a well of not less than 100 barrels a day. At the present time there are over five hundred wells pumping, which produced in 1903 over 15,000,000 barrels of oil. There is no reason why this district should not have two thousand wells, with

a production of over 40,000,000 barrels per annum. Baku, with only 2,400 acres of proven territory, has been producing 50,000,000 to 75,000,000 barrels a year for ten years. We certainly can not be accused of exaggeration when we claim half the production from double the acreage. The balance of the oil produced last year came from Ventura, Fullerton, Whittier, Santa Maria, McKittrick and Coalinga. There are in the State at the present time 2,800 wells.

At the beginning of this year there were forty refineries in the State. These refineries make kerosene, distillate, lubricants, asphaltum, coke, and many other by-products. The great refinery at Point Richmond, on the bay of San Francisco, constructed by the Standard Oil Company in connection with its pipe-line 278

OIL WELLS WITHIN CORPORATE LIMITS OF LOS ANGELES.

miles long from Bakersfield, is one of the largest in the United States, with a capacity for handling over 10,000 barrels of oil a day.

It was believed up to a few years ago that California oil with an asphaltum base could not be refined for kerosene at a profit, but the most of the kerosene we are using on the Pacific Coast today is being made not twenty miles from the city of San Francisco.

Asphaltum. One of the most important by-products is asphaltum. This contains 99 per cent bitumen, and is absolutely impervious to water; consequently asphalt from oil is pure, while that imported is not in our sense a true asphalt at all, but a kind of bituminous rock filled with foreign substances,

which are soluble in water, therefore easily destroyed by rains washing out these particles of extraneous matter and leaving holes in the pavement made with it.

In 1898 the output of asphalt from California refineries was 12,000 tons, while last year it had increased to 100,000 tons. Of this last figure 90 per cent was exported to the Atlantic States and Europe.

There are seventeen refineries producing asphalt at present, but the industry is growing so fast that inside of five years, it is believed, twice seventeen will be required to supply the demand. The oils of the Kern River and Sunset fields carry from 30 to 40 per cent asphalt.

The amount of asphalt required for paving purposes alone, in

OIL WELLS IN THE OCEAN—SUMMERLAND, SANTA BARBARA COUNTY.

the United States, aggregates over 200,000 tons per annum. There are so many uses for this valuable by-product, in building, roofing (which strange to say is almost fire-proof), laying the floors of cellars, curing the porosity of brick walls, etc., that a large amount of the oil production will be absorbed in this way. It takes about twenty-two barrels of crude oil to produce one ton of refined asphalt.

The substitution of oil for coal in manufacturing plants and on railroads has necessarily displaced large quantities of the latter fuel. As California has little good coal, we import most of it from foreign countries, thereby sending out of the State millions of dollars a year; this money is now retained here and goes into the channels of trade.

The amount of coal imported into San Francisco during the past four years was as follows:

1900	1,624,126	tons
1901	1,444,404	"
1902	1,265,082	"
1903	1,152,816	"

Showing a falling off of more than 150,000 tons each year, and a difference of nearly 5,000,000 tons between the years 1900 and 1903; and this at a time when business was more active than it had been for many years. Assuming that last year we consumed 20,000,000 barrels of oil, it would have taken 5,000,000 tons of coal at $6.50 a ton to have done the work that this oil did; or if we estimate in dollars we would have sent out of the State $30,000,000

OILING ROADS.

to pay for this coal, but which we retained here toward the upbuilding of the commonwealth.

There is rapidly developing a large demand for oil in the sprinkling of roads. An oiled road is so much smoother, more durable, cleaner and less costly, that the rural authorities are fast adopting the plan of dressing them with oil; and even in the city of San Francisco the drives in Golden Gate Park, which borders the Pacific Ocean, have been oiled for the past three years. It takes about 150 barrels of oil to oil a mile of road (the oil has to be heated to get the best results), and it costs less than $200 per mile. There will probably be at least 1,000,000 barrels used in 1904 for this purpose.

Throughout the State we have already over two hundred miles of county roads, smooth and free from dust, by the application of oil, and it is only a question of a very few years before such a thing as a dusty or muddy road will be a curiosity.

The Southern Pacific and Santa Fe railroads are using oil exclusively in their locomotives and machine shops, and it is estimated that when they get their tankage set, these roads will use not less than 12,000,000 barrels a year. A locomotive uses about twenty-three barrels of oil a day. It is estimated that the Southern Pacific Company saves over $5,000,000 per annum by the substitution of oil for coal. These roads have also oiled their tracks for many hundreds of miles.

Nearly all the gas companies in California are now using oil in the manufacture of that illuminant. As there is in the neighborhood of 16,000,000 feet of gas used in a day, there will be consumed over 1,000,000 barrels of oil per annum in this industry.

California is as independent in the matter of cheap fuel as is any of the Atlantic States. Her oil is a better steam maker than coal, cheaper and more easily obtained. The oil fields already discovered could easily produce 200,000,000 barrels per annum (equal to 50,000,000 tons of coal), and there are other fields which have not yet been touched and may not be for many years; but the oil is there, and when the necessity arises the development will be made.

Cost of Wells.

Mr. Paul Prutzman, one of the best informed experts in California, writing to "London Petroleum Review," says: "Data are not at hand from which to state definitely the cost of completing a well, except in the Kern River field; in fact, at no other point are conditions uniform enough to allow one figure to apply to all parts of a field. In this district the average depth is about 1,000 feet, and wells can be contracted, including casing, at about $3,000 per well when several are to be drilled at once. Pumping rig and steam plant will, under the same conditions, add about $1,000 per well, and general improvements another $1,000, bringing cost of completed well about $5,000. In the Sunset district the average depth is somewhat less, but cost of well would be about the same as at Kern; in the Midway there is much more range of depth, and cost would run from $5,000 to $10,000; at McKittrick about the same; and at Coalinga, from $4,000 to $8,000."

The cost of oil lands varies; the most expensive is in the Kern River district, where the little proven land there is for sale is held at about $5,000 an acre. In almost any of the other districts good land can be obtained for about $1,000 an acre. Of course, this last price is determined largely by the value of improvements surrounding the property. There is always plenty of land to lease on royalty, and the ordinary royalty paid is from 12 to 20 per cent.

Life of Oil Wells in California.

The life of an oil district depends upon the number of proven acres and the depth of the oil land. Experts contend that about 20 per cent of the sand is oil, and that about 80 per cent of the oil contained in the sand can be recovered; consequently, in a district where the sand is 300 feet thick, there should be a little less than half a million barrels to the acre, or a patch of 20 acres,

roughly speaking, should give 8,000,000 barrels. There are many wells in the Kern River district which have been pumping continuously at the rate of over 200 barrels per day for the past two and a half years, and which show absolutely no diminution as yet.

AGRICULTURE IN CALIFORNIA.

By ARTHUR R. BRIGGS,
General Manager of the California State Board of Trade.

Under varied conditions, farming in California has more features of interest and presents greater opportunities than in any other State. The wide range of products and the peculiarities of soil, climate and weather afford abundant scope for the energies and experiments of the wideawake tiller of the soil. Despite the impression that prevails in states east of the Rocky mountains, the rules under which farming is profitable elsewhere are applicable here. The stock-raiser in any other part of the United States would not be at a loss to understand the features of difference in stock-raising in California from those which obtain in the older states, and to adapt himself to them. The successful and intelligent farmer in any other state would be equally successful here, and his experience wherever gained would be as useful. If the business involves less expenditure and less care on account of more favorable conditions, this would not necessitate the unlearning of anything, nor operate against the introduction of methods that have been successfully employed in other states. This statement applies to all branches of agriculture, for the reason that farming, like any other occupation, involves a fundamental knowledge, fortified with practical experience, and the intelligence to understand the importance of adapting that knowledge and experience to different conditions.

When it is understood that California, the second state in size in the Union, has a total land area of 155,980 square miles, or 99,827,200 acres, of which 28.9 per cent, or 28,828,931 acres, were included in farms when the census of 1900 was taken, some general idea of its magnitude as a farming area is received. But no part of California has yet been developed to its capacity, either as to products or in the selection of such as are ultimately to be of the greatest profit. Intensive farming has been exemplified in several counties, but not one of them has its whole cultivable area in crops. Another consideration in estimating the agricultural possibilities of California is that the soil and climate are favorable for the growth of all the products—that is, valuable and high-priced crops—which made the region around the Mediterranean unique and gave it an exclusive trade, until California intervened; also, that here in the

same localities and in adjoining tracts, the raisin, the fig, corn and other cereals, and all the vegetation and fruitage common to the strictly temperate zone, thrive to perfection.

That the extensive grain fields of former years have been or are being converted into farms of less acreage devoted to a new cultivation, and that the combined harvester, which cuts, threshes and sacks the grain ready for market, with its thirty-two mules as a propelling power, is gradually being supplanted with the machinery suited to smaller holdings, are evidences of a new and more modern civilization which is in the line of industrial progress. But this does not remove California from the list of large cereal productions. The grain product of the State, though small as compared with some

COMBINED HARVESTER AT WORK.

former years, for the season 1902-03 aggregated 537,909,500 pounds or 8,965,158 bushels of wheat, 875,000,000 pounds or 182,291,666 bushels of barley, 12,085,200 pounds of rye and 117,500,000 pounds of beans.

Agriculture in California, it should be understood, has passed through several phases. Immediately after the subsidence of the characteristic era of placer mining, the cultivation of cereals began on a very large scale. Fruit was considered to be only of advantage for home needs. When it was discovered that green deciduous fruits could be successfully marketed as far eastward as the Atlantic Coast, and ultimately in Europe, and that the distribution of canned and dried fruits might be effected on a larger commercial scale, other branches of farming began to attract attention. In-

telligent experiments led to the discovery of many fruit varieties that could be successfully grown and marketed.

The limit of products that may be grown in California is co-extensive with the range of products in all semi-tropical and strictly temperate lands. Means have been discovered to pollinate the fig, so that in California the Smyrna fig is successfully produced, and promises eventually to supply the world. That this is no idle dream is shown in the fact that already California raisin-producers, after but few years' experience, practically have the whole United States as a customer. The prunes of California have driven French prunes largely from the American market, and are pressing the foreign market for a leading position. California dried and canned fruits have secured the trade of the United States and have for several years been extensively exported to Europe and to other parts of the world.

No agricultural experiment that has ever been tried in California has been a failure from the viewpoint of production. It is accepted as a fact that "everything will grow in California." Its great variety of elevation and of climate provide all the conditions essential for plant growth. The most forbidding deserts blossom like the rose at the magic touch of water. Plenty waits only industry, intelligently applied, to give large rewards in all parts of the State, with the exception of the higher altitudes in the mountains. The foothills and the valleys, the interior and the coast counties alike, are prolific in agricultural products. In the northern and central counties of the State crops have been annually produced at commercial profit without artificial irrigation; but it has been demonstrated that artificial irrigation not only enhances the yield greatly, but is an assurance of success. Wherever there are well-established irrigation systems, fruit crops are certain and large. The southern counties of California have from the beginning been compelled to rely upon artificial irrigation, the rainfall south of the Tehachapi Pass being much less than in the counties farther north. The northern and central counties have also of late years created large and successful irrigation systems.

Governor George C. Pardee has recently pointed out what must arise in increased fruitfulness from the great irrigating canals and their laterals. In an address on irrigation he said: "Here in California we have seen the benefits of irrigation. Thirty-five years ago the district where Pasadena, Redlands and Riverside now are was a desert on whose lean and dreary acres a few head of cattle were able to get a precarious living. It was a land of cactus, rattlesnakes, jackrabbits and coyotes. Out of what was then desert there go, this year (1903), alone 30,000 cars of oranges; several great cities now people its former solitudes, and Southern California has become a land of wealth and luxury. What brought it all about? Why, nothing but the wedding together of irrigation water and the desert. Without the irrigating ditch Los Angeles could be nothing but the village it was before, and Pasadena, Redlands and Riverside could have no existence. There would be no oranges there, and the mil-

lions of dollars that this industry alone brings into them would not be theirs. A quarter of a century ago, Fresno county, that produces by far the greater part of the raisins the United States now uses, was practically a desert, worth, for sheep pasture, in the springtime, two or three dollars an acre, although the average rainfall there is about nine inches per annum. Since the water of Kings river has been put upon it, in that district where formerly the sheepherder was lord of all he surveyed there are now 65,000 acres of irrigated land. The great valleys of the San Joaquin and Sacramento, from Bakersfield to Redding, with the great rivers traversing them from end to end, now, with here and there a small and notable exception, raise but a tithe of what should there be raised.

AFTER THE THRESHING.

The towns are small and few and far between, and one rides sometimes for miles without seeing even a farmhouse. Yet the 20,000,000 acres of land lying in and immediately tributary to those great valleys is at least as fertile as that at Riverside and Fresno. And were its owners to put their dependence no longer in the rains that fall from heaven, but would turn upon their acres the water that now runs swiftly by them to the ocean, villages, towns, cities would spring up like magic, and, where now but tens of thousands live, millions would have their habitation."

Some idea of the fruit industry of the State may be had from the statistics of shipments for the year 1903. These are compiled by the California State Board of Trade, and are as follows: 104,198 tons of green deciduous fruits, 299,623 tons of citrus fruits, 149,531

tons of dried fruits, 39,963 tons of raisins, 9,377 tons of nuts, 69,689 carloads of fruits by rail and sea, 8,661 carloads of vegetables by rail and sea, 9,733 carloads of wine and brandy by rail and sea, 88,084 carloads of fruit, vegetables, wine and brandy by rail and sea.

There was a net gain in 1903 of 10,546 carloads as compared with the shipments for 1902, of which 7,395 carloads were citrus fruits. Vegetables made a gain of 1,705 carloads; wine and brandy a gain of 865 carloads; canned fruits a gain of 1,356 carloads, and green deciduous fruits a gain of 380 carloads. The raisin output in 1903 was greater than that of any preceding year.

The shipment of oranges from Northern and Central California was 2,246 carloads; being an increase of 598 carloads as compared

ON THE WAY TO MARKET.

with 1902. Most of California's oranges are grown in the southern part of the State; practically all the fresh deciduous fruit was shipped from Northern and Central California. The raisin center is in Fresno county and vicinity; the prune center is in Santa Clara county and vicinity; of the dried fruit over 85 per cent goes from the northern and central portions of the State, and these sections give an exceedingly large percentage of the canned fruits; the walnuts are principally grown in the south, while the almonds are mostly from the north; the fresh peaches, pears, cherries, plums, apricots, etc., nearly all go from north of the Tehachapi mountains, which divide Southern California from Central and Northern California. The annual production of wine is now about 30,000,000 gallons.

The beet sugar production during the year 1903 amounted to 65,360 tons. This industry is capable of large increase and is attracting considerable attention. Experience and scientific experiments, as well as climatic conditions, attest the superior merits of California for sugarbeet-growing.

The opportunities for development of tobacco-growing are recognized. The peculiar quality of soils in California renders fertilizing unnecessary for the tobacco plant, which is a material saving as compared with other states. The absence of frost during the growing season is a feature of importance in the cultivation of tobacco. Parties most familiar with tobacco-growing contend that it will ultimately be largely engaged in and be profitable here.

GRAIN BARGES ON THE SACRAMENTO RIVER.

Livestock-raising is very largely and successfully engaged in. The foothill and mountain districts, at one time erroneously considered among waste lands, furnish rich pasturage—the higher mountain elevations in summer, and the foothills in winter—thus giving favorable conditions the year around. Animals in this State mature and reach their growth at an early age. A two-year-old animal attains about the size of a three-year-old in other states. A large area of alfalfa during the last few years has added greatly to the livestock interests.

Stock-growers are now supplied with the finest breeds of cattle for all uses and extensive herds are found in all parts of the State.

The breeding of horses and mules has been a prominent factor in

agricultural development. California thoroughbred horses have stood in the front rank for many years.

In the earlier development of California the sheep industry became a prime factor. As late as 1876 sheep numbered nearly 7,000,000 and the annual production of wool reached over 56,500,000 pounds, bringing over $10,000,000 to the State. Other agricultural pursuits became more profitable, besides the demands of increased population displaced sheep husbandry, and after 1876 sheep-raising declined in importance. It is, however, still a large industry, both for mutton and for wool, and will continue to be, as the ranges unsuitable for cultivation in the foothills and mountains are well suited to this industry. The present product of wool for the State aggregates about 22,000,000 pounds.

Hogs are extensively raised, but not in sufficient numbers to supply home needs. With the increased acreage in alfalfa and the extension of the dairy interests this branch of farming is on the increase. Indian corn, the great product of the Middle West for fattening hogs, is lacking in the State, and its substitute is barley, which is found to be equally well suited to that purpose. This branch of farming is capable of large increase. On account of the quick returns and the sure profit it affords, hog-raising is attracting much attention.

Despite the fact that every possible condition favorable to the poultry business exists, large quantities of eggs and poultry are imported annually. It may surprise the farmers in the East and West when the fact is known that some farmers in California send to the town store for butter, eggs and chickens. Eggs and chickens are generally the by-products of the Western farm, but they go a long way toward the support of the family. The California farmer has yet to learn the value of the farm by-product.

As to the profits of poultry as a distinctive and separate business, statistics are not obtainable, but there are successful poultry farms in this State. There can be no doubt of the wisdom of every farmer raising poultry for his own wants and some for market.

The production of honey is worthy of consideration. In the central and southern portions of the State, and to some extent in Northern California, the business is made a separate occupation; the output is large and finds market in the East and West. As a by-product of the orchard and farm, bee culture has value. In orchards it has been found that bees aid in the pollenization of the fruit-tree blossom.

It will therefore be seen that agriculture in California covers a wide scope and affords opportunity for important development. The last quarter of a century has given demonstration sufficient to justify expectation far beyond any present development. The application of scientific methods is bringing into this department of industry intelligence and capital from various parts of the world that promises great results. This, coupled with peculiar climatic conditions, gives to farm life and the country home features of attraction hitherto unknown. Through quick and frequent com-

munication with towns and cities by the introduction of electric car service, which the development of electric power makes possible, the element of ease and comfort is brought into intimate relation with rural life and the rural home.

For free information in respect to California, address "California State Board of Trade," Ferry Building, San Francisco, Cal.

HORTICULTURE IN CALIFORNIA.

By E. J. WICKSON,

Professor of Agricultural Practice, University of California, and Horticulturist of the California Experiment Station; author of "California Fruits and How to Grow Them," and "California Vegetables in Garden and Field"; Horticultural Editor of the "Pacific Rural Press" of San Francisco.

Certain facts which are of great interest and importance in connection with fruit-growing in California are these:

First—Fruit-growing and the manufacture of fruit products constitute the leading industry of California. The output, from its beginning on a large commercial scale about 1880, has shown an average increase in value of about $1,500,000 per year, and has now reached a total annual value of more than $35,000,000. This constitutes California the greatest fruit-growing state of the Union.

Second—The reasons for this eminence of California in fruit-growing are several:

(*a*) The possession of climate which insures the life and thrift of the tree or vine. This can be appreciated when it is understood that, except at elevations greater than those chosen for fruit planting, there is no cold severe enough to freeze the ground and no winter-killing of trees.

(*b*) The length of the growing season, the absence of summer rains, the brilliance of the sunshine, and the adequacy of sun heat promote size, beauty and quality of fruit and favor the manufacture of evaporated fruits at a minimum cost.

(*c*) The combination of conditions, which befit the growth of both semi-tropical and temperate zone fruits, gives California command of a variety of fruits which no other state possesses in such fullness and perfection. This will appear more clearly as the different fruits are separately discussed later in this paper.

(*d*) The occurrence in California of vast areas of deep, loamy soils, rich in plant food, easy to cultivate and encouraging root growth to a depth of ten feet quite generally and occasionally twice and even thrice that depth as shown by actual digging. Though this is true, it is also true that shallower soils are successfully employed in growing fruit.

Third—Aside from natural conditions of climate and soil, fruit-growing has reached its present eminence in California through the high intelligence, energy and business ability which are found in the

agricultural population of the State. These qualities of citizenship have made it possible to develop methods of growing, preserving and distant marketing of fruits which are new and characteristic of California. The employment of these methods, coupled with the acceptable nature of horticultural work and the opportunity to pursue it nearly the whole year, renders it possible for a horticultural worker to accomplish with ease and comfort twice the work which can be compassed in climates which add the embargo of winter to the depression of hot, moist summer weather.

Fourth—But after all, and probably, the underlying secret of success in California fruit-growing is the conception of the tree or vine as a producing machine which must be developed and maintained in the highest degree of efficiency. This idea of a tree widely prevails, and in commercial plantings is sharply and diligently pursued. The tree must have the best shape to bear a fair amount of large, well-developed fruit. It must be a low tree in order that all work upon it can be most cheaply done. It must grow every year a sufficient amount of strong, new wood, and to do this it must be pruned to prevent over-growth and over-bearing. On the other hand, satisfactory growth and fruit-bearing must also be promoted by constant cultivation of the soil and by irrigation and fertilization, when necessary. It must be protected in its strength by the absolute destruction of injurious insects, blights and diseases. All this signifies that the tree must be maintained in full possession of its producing powers, and the California grower expects to stand beside his trees, constantly training and pushing them to their work and generously assisting them to all that they need to do it well. It is this conception of the grower's relation to his trees and the discharge of the duties which such relation requires which have brought to California fruit-growing such notable success and wide repute.

Fifth—California fruit-growing has reached its present eminence because of the wide application of business principles in production and in trade. Many of the leading fruit-growers were formerly prominent and successful in manufacturing and commercial affairs at the East and abroad. They brought to California the wisdom born of experience. They invented new processes and appliances and they applied the most advanced commercial methods. They matched the favoring natural conditions of soil and climate with their own skill and energy in using them to the best advantage. They have demonstrated the advantage of co-operative organizations for handling fruits in the packing-house and in the markets so clearly that California methods are commanding attention in all parts of the world.

VARIOUS FRUITS COMMERCIALLY GROWN IN CALIFORNIA.

It may be most interesting and convenient to those seeking information about California fruit-growing to state a few of the leading facts about each of the fruits, under its own name, and for ease of reference, an alphabetical arrangement will be followed in each of the groups into which the fruits naturally divide themselves.

CHAMBER OF COMMERCE, LOS ANGELES.

DECIDUOUS ORCHARD FRUITS.

Apple. California has about 3,500,000 apple trees in orchard, of which one fifth are not yet in bearing. The success attained in growing a winter apple very satisfactory to the trade and capable of distant shipment constitutes this fruit one of the most promising and popular at the present time. About one thousand carloads are shipped beyond state lines and a considerable quantity reaches the London market, selling at the highest prices. There are two distinct branches to the apple industry of California: one is the growing of early varieties like the Astrachan and Gravenstein for sale in the northern parts of the Pacific Coast and in the interior mountain states before the earliest apples can be ripened in those parts. The localities where these early varieties are chiefly grown for such shipment are in the Sacramento valley and the foothills surrounding it. The forcing heat of the spring and early summer brings these varieties quickly to notable size, crispness and flavor. This heat, however, continued into the summer and autumn, makes the same districts quite ill-suited for the growth of winter apples, which are prematurely ripened and lack quality and keeping power.

The second branch of the California apple industry, then, the production of winter apples, is undertaken in parts of the State quite different in climate from that of the early apple regions. The requirements of a winter apple are fully met by two main divisions of the State, viz.: the smaller valleys close to the coast, in fact, in some cases, the coast flats, where the exposure is directly toward the cooling breezes of the ocean which produce a cool summer—a long, slow-growing season, which develops the greatest beauty and highest quality in a winter apple. Similar results are also produced by the climate found at an elevation of from 2,500 to 5,000 feet on the interior plateaus and in the mountain valleys. The coast district has developed a greater commercial apple industry than the mountains, because transportation facilities for shipment are vastly better; but as the State advances the mountain districts will be employed in this production much more largely than at present. The greatest apple district of the State is the Pajaro valley, including parts of Monterey and Santa Cruz counties, centering at Watsonville, which shipped about one thousand carloads of apples in 1903. The counties next prominent in apple-growing are Sonoma, Mendocino and San Luis Obispo, while many other counties have good apple orchards in less total acreage; in fact, from San Diego on the south to Siskiyou on the north, localities exist which afford the elevation or the coast exposures which favor the production of good winter apples, and planting is progressing in all these districts.

Apricot. California has about 3,000,000 apricot trees, which stand in the open air without protection of any kind and bear large, luscious fruit. That apricot trees can do this constitutes one of the unique features of California fruit-growing and proclaims it different from fruit-growing in other states, for, excepting a few localities in other parts of the Pacific

PERMANENT EXHIBIT OF THE STATE BOARD OF TRADE, SAN FRANCISCO.

Slope, California has a monopoly of apricot-growing. And yet the apricot does not find all parts of California suited to it. The whole northwest quarter of the State, north of San Francisco bay and west of the high ridges of the Coast Range, does not grow apricots commercially, nor does this fruit anywhere ascend above an elevation of 1,500 feet upon the foothills. It is particularly a fruit of the protected coast valleys south and east of the bay of San Francisco to the southern end of the State; also of the great interior valleys and lower foothills, avoiding, however, the low places in these valleys where spring frosts may injure the crop though the tree is not harmed. For these reasons it is wise to choose locations for the apricot with some discrimination, but such large areas of land are practically safe that the present great product can be several times multiplied if the world's markets should favor it. The California apricot is of superior size and quality, and in canned and dried forms is finding a free field in the countries of northern Europe for any surplus which is not required in the United States.

A point of advantage with the apricot, as with the pear and peach and to a less extent with the nectarine and plum, is that it has three great lines of demand: first, as fresh fruit, of which 231 carloads were shipped to Eastern markets last year; second, as canned fruit, with a product of 648,716 cases, each containing two dozen 2¼-pound cans; third, 20,000,000 pounds of dried apricots. Nearly 3,000,000 apricot trees are growing in California; counties having over 100,000 trees each are as follows: Santa Clara, Solano, Ventura, Los Angeles and Alameda, while several other counties closely approach that limit. Some of these counties are five hundred miles apart and their success with the apricot shows how widely suitable locations are distributed over the State.

Cherry.

The cherry is one of the lesser orchard fruits of California, because the regions which favor it are fewer and because its commercial field is less; but in the size and quality of the fruit and the prolific bearing of the tree the cherry is a great fruit in locations which meet its requirements. The cherry requires a modification of summer heat and of the dryness of the summer air, and for these reasons it does not thrive on the interior plains, even when irrigation is employed to regulate soil moisture. In the coast valleys, however, in the upper part of the State, in the smaller valleys tributary to the great Sacramento valley and on the river lands, where depth of soil prevails and modification of air-dryness is secured by abundance of adjacent water, the cherry behaves magnificently. Elevation also secures conditions suitable to the cherry in some cases, notably in Southern California, where the product of trees in mountain valleys at an elevation of 2,000 feet or more is satisfactory and profitable, though the trees on mesas below, where citrus fruits thrive, are disappointing. There are about 750,000 cherry trees in California, of which Santa Clara, Alameda, Yuba and Solano have the largest plantings. Cherry-drying has never largely prevailed in California. The shipment of fresh fruit to the East has overcome its chief difficulties and is

now rapidly increasing—the shipment of 1903 aggregating over 200 carloads. Cherries are constantly growing in volume as canned fruit, the product of 1903 being about 200,000 cases. The acreage at the present time is extending on the basis of the improving shipping and canning demand.

Peaches. The peach is the greatest orchard fruit of California of the deciduous class. A few years ago it was surpassed in acreage by the prune, but the prune was over-planted in situations not befitting it, and such unwise extensions have largely disappeared. This restores the peach to the supremacy which it held previous to that unfortunate incident, as it has had no reverses, but has rather gained continually in popu-

DRYING FRUIT.

larity. The peach has a very wide range in California. It goes beyond the apricot in the coast valleys north of San Francisco; it goes beside the apricot wherever the latter thrives in the interior; rises a thousand feet above it on the foothills, and goes lower on the plains into the frosted areas with less danger. The peach is a grand fruit almost everywhere; it has a ripening season with different varieties and different locations from May to December, though, of course, the midseason varieties constitute the great commercial crop. The varieties most largely grown are of California origin, being chiefly selected chance seedlings taken up by enterprising nurserymen on the approval of the growers with whom they originated. These varieties have gained fame by embodying qualities acceptable to three main lines of disposition indicated by these notes of the prod-

uct, viz.: Shipment of fresh peaches overland in 1903, 1,867 carloads (the greatest volume of any deciduous fruit); canned peaches, 676,000 cases (the largest canned product of any single fruit); dried peaches (1902), 50,420,000 pounds (larger than any other tree fruit except the prune). This product, as indicated above, is derived from nearly all parts of the State, though mainly from the great interior valleys (the San Joaquin and the Sacramento) and the foothills. Four counties, Placer, Fresno, Tehama and Santa Clara, have over 500,000 trees each, while Kings, Solano, Sonoma and Tulare have over 200,000 trees each. About ten other counties go above the 100,000 mark. The California peach, though it is now eminent, has even a greater future before it.

Nectarines. The nectarine is a smooth-skinned peach, but it bears no comparison with the peach in product or popularity. The canned product of nectarines is but 344 cases, and the dried product but 600,000 pounds. California produces a magnificent nectarine, but the demand for the fruit does not justify the effort.

Pears. Because of conditions favoring the growth of pears of the most popular market sorts in greater beauty and volume than they can be produced in older states and countries, the California pear has commanded wide attention in distant parts of the United States and, like the apple, has commanded the highest prices for the fresh fruit in the London market; in fact, the pear stands next and very close to the peach in this trade, 1,719 carloads being shipped out of the State in 1903. The pear also is high in canning, the product being 423,831 cases; in drying, the same is true, as the normal annual output is about 6,000,000 pounds. The pear resembles the peach in its wide range over coast valley, interior valley and foothill situations, but it extends beyond the peach, for it goes to an altitude of 5,000 feet on the mountains and it descends to the lowest places in the valleys, for neither frost nor standing water can avail against it. It escapes frost by its slow start in the spring, and it endures water and even a degree of alkali in the soil by the hardy character of its root. In ripening, also, it is not injured by a degree and duration of heat which ruin the quality of a winter apple. Until very recently the pear was free from the "fire blight" in California, and there seemed no limit to the possibilities in pear-growing. At present blight shows itself, but is restricted in area and may be circumscribed. The pear census shows the existence of about 1,800,000 pear trees. The leading pear counties are Solano, Santa Clara, Placer, Fresno, Sonoma, Sacramento, El Dorado, Contra Costa, Yolo, Yuba, etc., but almost every county in the State grows the fruit in commercial quantities. The varieties grown are comparatively few and the Bartlett is chief, because there are fully two months between the first to mature in early districts and the last in late districts, and during all this time supplies are ample for shipping, canning and drying of this one exceedingly acceptable variety which permits no intruders while it is in season. The growing of later pears is

limited, because the Eastern-grown winter pears are usually available in large quantities in the Eastern markets after the California Bartlett has had its run. Still, a few shippers are making excellent records with winter pears in distant markets.

Plums and Prunes.

By demonstrating the suitability of the climate for the free-fruiting of the choicest varieties of the European plum, California growers freed themselves from the burden of building up on the basis of the wild American species which Eastern growers have done with so much credit to themselves. California has no need to seek hardy plums, for the tenderest are perfectly satisfactory; nor does California have to circumvent the curculio and the black knot, for these have never ap-

CURING PRUNES.

peared in the State. The French prunes were introduced at an early day and the product was so successful and profitable and won its way by displacing European prunes in American markets that there arose ere long almost a rage for prune-planting, the product of which, rising to nearly 200,000,000 pounds of dried prunes in 1902, has outgrown the requirements of the United States and is being pushed for sale in Europe, even in France itself. Probably even greater success than could have been anticipated in disposing of this immense volume of prunes has been attained, and yet as free and profitable an outlet as is necessary has not been secured. The prune has been depressed, acreage has been somewhat reduced (as stated in the foregoing discussion of the peach), and at present there is a general sentiment against prune-planting, except where an

exceptionally large fruit can be counted upon. Strenuous efforts are being made to popularize the prune as a desirable food, to push the product into markets in all parts of the world, and to realize fair returns for such an excellent fruit as the California prune is conceded to be. Good results may be expected from such efforts, but it is probably wise to be conservative about extending the acreage until some assurance is had. California has invented new processes of curing prunes by machinery and other labor-saving appliances, and has endeavored by human devices to match the economy of production to which nature contributes free sunshine and dry air. Probably nowhere in the world can so rich and delicious a fruit food as the California prune be so cheaply produced, and it is reasonable to expect that the world will need all that can be produced when organization for distribution and trade is made effective. The largest prune-producing counties are Santa Clara (which has nearly one-half of all the prune trees in the State), Sonoma, Alameda, Solano, Tulare, Santa Cruz, Kings, etc.—both the coast valleys and the great interior valleys participating in the production.

Of plums, aside from varieties which are dried without removal of the pit (and therefore called prunes), the production is relatively small and largely restricted to the Japanese and a few other varieties which are particularly adapted to fresh-fruit shipments and canning. These fruits are largely grown in the districts where early ripening can be counted upon. The size and beauty of the shipping and canning plums of California are striking, and the product reaches a good volume, viz.: plum shipments, fresh, in 1903, 1,145 carloads; canned plums, 125,567 cases; dried plums (other than prunes), 2,200,000 pounds.

NUTS.

Almond. California produces practically the whole of the almond crop of the United States and thus stands as the only source of a home-grown almond supply for American markets. The California interest is large, comprising 1,425,074 trees, and the product in favorable years reaches about three hundred carloads. There is, however, considerable irregularity in the annual crop, because some districts are liable to frost injury. The almond is a very restless tree during the California winter, for the temperature in the valleys is always near the point which induces blooming and rather a light frost may injure blossoms and young nuts. For this reason it is very important to select locations for almonds where there is a minimum danger of frost. These are found on the bench lands around small valleys, while the bottom lands in the same valleys might be quite frosty and should be planted with later blooming fruits. Frosts are also less frequent on the plains of the interior valleys where there is a free circulation of air which tends to equalize temperatures, while on the river bottom lands the trees may be unproductive though growing thriftily. The almond does not thrive at elevations in the foothills and seems to be a bench and valley fruit, but even within these

limits locations must be chosen with close attention to local topography. The chief product is grown in Yolo, Contra Costa, Solano, San Joaquin and Tehama counties, which are all in the central and northern regions of the State, although many other counties contribute in a smaller way.

Chestnut. The California chestnut product is small and consists almost entirely of the Italian variety grown in the interior valleys and foothills. The production of the best chestnuts of American and European varieties can be largely and

HARVESTING ALMONDS.

probably profitably increased, but no particular attention has been paid to the matter, except by a few enterprising growers.

Peanut. On light loams all through the lower lands of California, the peanut thrives well and makes a large product of exceptionally large, bright and well-filled nuts. In Southern California the chief product is on the lower lands of the coast region, while in Central and Northern California peanuts are mostly grown on the alluvial loams of the river bottoms of the Sacramento and San Joaquin valleys, although the crop is sometimes raised between fruit trees on the light upland loams. The product is quite profitable to those who master the details. Though it might be a question as to whether California should enter into competition in the general markets of the country, there seems no good reason why the crop should not be brought up to the demand for local consumption. At present only about one-fifth of the peanuts used in California are grown here.

Pecan. The pecan grows well and bears well in the lower lands of the interior valleys. It does not behave well near the coast where the seasons are not well defined, nor does it thrive in the drier regions of the interior. On deep lands, however, where moisture is ample and where the approach of autumn is marked by rather sharp frosts, the pecan stops its growth and matures its nuts satisfactorily. The product has not yet risen to commercial importance.

Walnut. The English walnut is the greatest nut grown in California, judged by the volume and value of the product, by the breadth of its adaptability to California conditions, and by the greatness of its outlook. The present commercial product is about one thousand carloads in a good season, and there are upwards of 500,000 trees in orchard—about one-third of the number not yet in bearing. The present product is almost entirely grown in three counties in Southern California: Orange, Los Angeles and Ventura, and the adjoining counties of Santa Barbara and San Luis Obispo stand next in acreage of walnuts. During the last few years, however, owing to the profitableness of the walnut, there has been a large planting in the central part of the State, and the product of the future will be drawn from a wider territory than hitherto. The walnut tree is, in fact, content with the coast, interior valley and foothill climates, providing it has sufficient depth of soil to sustain it and to furnish the constant, but not excessive, water supply which it needs. Where the rainfall is large and the soil deep enough to retain moisture and yet open enough to prevent standing water, walnuts yield satisfactory results without irrigation. In places with light rainfall or where the soil is too shallow or non-retentive to hold moisture for the long growing season, irrigation is requisite. There is, however, need to select varieties with some regard to localities. In Southern California a local seedling, known as the Santa Barbara soft-shell, is chiefly grown. This variety is not so well adapted to conditions in the upper part of the State. The French imported varieties and some California seedlings locally originated are better and are now being largely planted. These varieties are hardy against spring frosts because of their later blooming, and they resist the sun heat of the interior. The Southern California variety is injured by these agencies, but as they are reduced to a minimum in the Southern California coast regions, the resistance of a variety is not of as much concern.

THE GRAPE AND ITS PRODUCT.

The grape grows in all parts of California from near sea level on the coast to an elevation of five thousand feet or more on the mountains. It is contented, too, with nearly all fertile soils, from the deep valley loams where the great, fat, firm-fleshed grapes are grown for raisin and table purposes, to the shallower soils of the high foothill and mountain slopes, where the grapes are less in quantity, but of superior aromatic quality. This wide adaptation gives an immense area suitable for grape culture, but the chief reason for the

LARGEST GRAPEVINE IN THE WORLD—CARPENTERIA, SANTA BARBARA COUNTY.
62 years old; trunk 8 ft. 3 in. in circumference; branches cover one-half acre; bears 10 tons of grapes a year; will shelter 800 persons.

achievement and the promise of the grape in California is in the fact that the European species, *Vitis vinifera,* thrives, and thus the California grower has command of all that Europeans have accom-

plished in centuries by developing special varieties of the species for special purposes. The grapes of the states east of the Rocky mountains are not grown in California because the European varieties are the only ones from which raisins can be made; they also furnish the world's wine and brandy and they give size, beauty and shipping quality beyond all comparison with American varieties. Wherever wealthy Eastern connoisseurs choose grapes for their glass houses they select European varieties; the Californian grows his "hothouse grapes" in the open air. He also grows them without the cost of trellising, because most of the European varieties will bear well in short-pruned bush form.

California has a large acreage of grapevines, and planting has been very active during the last few years because good prices have prevailed. The number of acres of table grapes is about 22,000; of raisin grapes, 90,000; of wine grapes, 100,000. Table grapes are grown for local use everywhere and for shipping, chiefly in Sacramento, San Joaquin, Placer, Fresno, Santa Clara and Santa Cruz counties, although other counties participate in this branch, which sent out of the State nearly 2,000 carloads in 1903.

The raisin interest is chiefly concentrated in the center of the San Joaquin valley in Fresno and Kings counties, though there is a raisin product of some moment in the Sacramento valley and in Southern California. The total product of raisins is upward of 100,000,000 pounds.

The wine and brandy interests are widely distributed through the length and breadth of the State. The product of the year ending June 30, 1903, is placed at 32,000,000 gallons of wine and 5,700,343 gallons of brandy—the latter being exactly known, as it is under the supervision of the United States revenue officials.

SEMI-TROPICAL FRUITS.

Space will admit only of reference to those fruits of the semi-tropical class which have reached considerable commercial importance; others which are at present succeeding with amateurs, and some of which may ere long reach economic account, are too numerous for discussion. Suffice it to say that the date fruits freely in central parts of the State and is now to be advanced by systematic effort through plantings on the Colorado desert by the United States Department of Agriculture. The banana is fruited for home use in many thermal situations. The pineapple is grown in frostless places near the coast in Southern California. The cherimoyer is found in the markets of Los Angeles, while the alligator pear grown in Southern California reaches the markets of San Francisco as well. The latter fruit is quite hardy in several parts of the State. The guava and the loquat are produced for local use, and new varieties of the latter originated in Southern California are likely to be widely known. The persimmon and pomegranate grow in nearly all fruit districts, but only a limited amount can be profitably disposed of either locally or by distant shipment. Many other fruits deserve like mention, but must be passed over.

Fig. The fig is one of the great fruits of California. Old trees attain the dimensions and aspect of oaks and bear so much fruit that it becomes of some importance in swine-feeding. The tree is perfectly hardy in all coast and interior situations (except in a few places where the temperature falls ten or twelve degrees below freezing) and no thought is given to protection. This fact, demonstrated more than a century ago by the padres at the old missions, naturally suggested the fig as a great commercial fruit and for decades it has been successfully grown, and trees have been reported to the number of 251,856 in nearly all counties except those of the mountains. Production has, however, been restricted by the fact that fresh figs do not take kindly to long shipment, and by the fact that our dried figs did not compare well with the product of Smyrna. This condition has, however, been completely changed by the experience of the last two years. The fig industry comes upon a new basis through the successful introduction of the pollination insect which is essential to the success of the Smyrna fig. California Smyrna figs are now being produced in considerable quantities and California is thus equipped to enter into competition with the time-honored Asiatic product for the world's trade in dried figs. Trees of the true Smyrna varieties, and of the wild fig which favors the multiplication of the insect, have been growing for years in different parts of the State, but the insect was absent and the trees unproductive. With these old plantings and the new orchards now being planted, there will be a large product of higher-class dried figs than has been produced hitherto. Much interest is now being manifested in this enterprise.

Olive. The olive is another fruit which has been successfully grown in California for more than a century. The importance of the olive as a food in the south of Europe and its standing as an export thence to populous northern countries, coupled doubtless with its favored place in song and story, induced a premature popularity among California fruit-planters, and experience with the fruit has not justified all the expectations cherished for it. Planting has practically ceased and considerable acreage has been displaced. There are many difficulties with the olive which may be briefly mentioned: The popularity and acceptability of cheap substitute oils for salad purposes militate directly against profitable production of olive oil, because appreciation of the superiority of the latter is less liberal than expected; pickled ripe olives are difficult to produce with good keeping qualities; the fruit itself is largely subject to interior decay in advance of maturity; the trees of many varieties which have been largely planted are shy in bearing; trees planted in dry places do not grow and bear as promised by optimistic promoters; the work of gathering the fruit and securing its products is more difficult and costly than calculated. The fact is, the olive was boomed in California along spectacular and speculative lines, and the industry must outlive the mistakes which have been made. California will produce profitably good olives and olive products in suitable places and through the efforts of

masterful men and women who can rise to the requirements of production and protection against imitation articles of the trade.

Lemon. Wonderful progress has been made in developing the lemon industry in California, and imported lemons have been measurably displaced from the markets of the United States by the California product. New varieties have been secured, and new methods of culture and fruit-handling have been devised. The record of planting shows nearly 2,000,000 trees now growing in the State and about 2,000 carloads of the fruit have been shipped to distant markets in a single year. Though lemon-growing is practiced in most sections where oranges are produced, the present product is chiefly made in the three counties of Santa Barbara, Ventura and San Diego; all of them coast counties of Southern California and the last named county is the banner lemon county of the State. The lemon does best in a practically frostless place, being more tender than the orange. For this reason the chief product is in the southern coast counties. In suitable situations in the interior, however, the lemon does well, but has been largely displaced by the orange, which has been on the whole more profitable and is marketable fresh from the trees, while the lemon requires curing and a good part of the crop has to be held from winter maturity to be sold in the following midsummer, when the chief demand for lemons occurs.

Orange. California has accomplished more with the orange than with any other single fruit, and the advance during the last few years has been exceedingly rapid. At present, not only is the United States largely supplied with California oranges, but the fruit is being successfully sold in England and Germany. There are upwards of 5,500,000 trees in the State and the shipment beyond State lines has reached 25,000 carloads. Nine-tenths of this vast amount of fruit comes from Southern California, but recent plantings have been largely in the foothills east of the San Joaquin and Sacramento valleys in the central part of the State. The orange thrives in suitable situations through a north and south distance of over six hundred miles, and the topography of the State is such that similar winter and summer temperatures occur all through this distance. There is fortunately, however, some difference in the ripening of the fruit in the different portions of this belt, and the northern portion, because of its mountain environment and distance from the ocean, has an earlier spring and summer and is therefore able to ripen its oranges for an earlier autumn market. This difference distributes the fruit through a greater number of months and is of great advantage to the product. In fact, by choice of early and late varieties and by using the variation in the season of maturity, California can furnish fresh oranges in large quantities all through the calendar year and renders the country practically independent of importations. Another advantage peculiar to California is that the orange grown in a dry summer is more dense in texture and has much better keeping and shipping quality than an orange grown in a humid summer. The fruit is also more sprightly

and refreshing, and though there is some controversy over the alleged superior sweetness of the Gulf fruit, the demand for the California fruit and the prices which it commands are evidences of its wide popularity. Although the California growers have made the most energetic and systematic efforts for the wide distribution of the product, for several years the fruit has proven so acceptable that it is evident that the consuming capacity of the United States is still beyond reach and the outlook for the California orange is very promising.

The pomelo, or grapefruit, is also grown in California, but has not met the extent of demand which was anticipated.

SMALL FRUITS.

In California the term "small fruits" signifies only berries and currants, as the cherry is always classed by us with other great orchard fruits and the grape stands alone as the foundation of a great fruit industry, as has been indicated. Aside from supplies for home use and local markets there is a large field for small-fruit growing for shipment. Berries are largely used by canners, as is shown by the output of 1903, viz.: blackberries, 35,556 cases; Loganberries, 4,307 cases; strawberries, 15,320 cases; raspberries, 6,505 cases. Small fruits are also shipped from California to markets from one to two thousand miles distant in the interior states and territories to the north and east. The earlier ripening of these fruits in California gives our shippers an opportunity to place the product in this vast region, although there are home-grown supplies later in the year. The growing of small fruits is scattered over the State, and the special regions are widely distant from each other. The most prominent for strawberries are the San Gabriel valley in Los Angeles county, the Pajaro valley in Santa Cruz and Monterey counties, and the Florin section in Sacramento county. There are, however, many places which have a smaller acreage, but special reputation for fruit out of season; in fact, it is possible to find ripe strawberries every month in the year at some point or other in the State.

A GENERAL REMARK.

On the whole, the fruit products of California are being easily disposed of at fairly remunerative rates, and the business is in good heart and enjoys a good outlook. There is, of course, fluctuation in the values of different fruits and in the market conditions which they meet at distant points. Such "off years" strike the fruits somewhat irregularly and are discouraging first to one special grower and then to another, and as our localities are largely given to specializing, according to favoring culture conditions, there is opportunity for complaint somewhere nearly every year. Still, we find that our fruit-growing districts have the busiest towns, the handsomest rural improvements, the largest assessment rolls, and are most attractive to homeseekers. While these things are true our fruit industries must be counted in prosperous condition, although the greatest anticipations are not always realized.

ORANGE-GROWING IN CALIFORNIA.

By A. H. NAFTZGER,
President of California Fruit Agency.

Entirely apart from the question of profit, the cultivation of the orange is doubtless the most fascinating of all horticultural pursuits. The hardiness and ready response of the tree to good care; its perpetual rich green foliage; the exquisite fragrance of its bloom, and the aromatic flavor of the fruit, all lend an unfailing charm.

The coming of the orange into California dates almost, if not quite, with the coming of the Franciscan missionaries, who were practically expelled from the missions in Lower California more than one hundred and thirty years ago. Coming up into what is now the Golden State, they established twenty-one missions, scattered from San Diego to the Sacramento valley, all but three of which had gardens and orchards. The orange was among the fruits cultivated in quite a number of these mission gardens. These early plantings of orange trees were as much for ornamentation about the missions and village plazas as for the fruit, and for nearly one hundred years the fruit produced only met the small local requirements of the scattered settlements. No authentic records are obtainable as to the exact quantity of oranges produced in those early years, as it was not until the secularization of the missions in 1834 that any inventories were made. That of the Santa Ynez mission reported 987 fruit trees; San Fernando mission, 1,600 fruit trees; San Gabriel mission, 2,333 fruit trees. After the secularization of the missions, even the limited fruit industry of those years began to decline, so that General Fremont, when visiting California in 1846, reported that: "Little remains of the orchards that were kept in high cultivation at the missions. Fertile valleys are overgrown with wild mustard. Vineyards and olive orchards are decayed and neglected." A few of the mission orchards passed into the hands of the early settlers, who turned them to great profit.

While, as stated, orange trees were among the earliest introduced into the State by the Mission Fathers, comparatively little was done in citrus fruit-growing until the last half of the nineteenth century. The most extensive orchard of early planting was at the San Gabriel mission, supposed to have been set out in 1804 by Father Thomas Sanchez. A small orchard was planted at Los Angeles in 1834 by Louis Vignes, and the same year, one by Manuel Requena. In 1841 William Wolfskill planted two acres, which was probably the first orange orchard set out in California with the primary object of profit. Other small orchards were set out at various points, including Old San Bernardino and Crafton,

so that in 1862 there were said to have been 25,000 orange trees in the entire State, two-thirds of which were in the Wolfskill orchard in Los Angeles. After this there was a somewhat steady but slow increase until 1870, when Riverside was founded with the special purpose to grow oranges.

It was only with the coming of the railroad into Southern California, affording transportation for the products of the orchard, that the orange industry gained impetus. Prior to that there were no markets accessible for any considerable quantity of fruit.

From 1870 to 1890 there was a veritable boom in orange-tree planting, which continues with considerable activity to this time. It is said that up to about 1873 not over $25,000 had been in-

IRRIGATING THE TREES.

vested in the orange industry in all of California. Today the direct investment in the citrus fruit industry in Southern California is fully $50,000,000, with fully another $50,000,000 of investments indirectly due to the citrus fruit business. This marvelous change was wrought chiefly by the coming of the navel or seedless orange.

The history of the navel orange in California reads like a fairy tale. It has revolutionized the orange business of the country. It has been the means of transforming thousands of acres of semi-desert land into soil probably as productive and profitable as any on the globe. It has brought into existence on hitherto arid plains a number of towns and cities ranging in population from 4,000 to 10,000 each. These settlements have become most progressive

in every way. They are the homes of people of taste and refinement, demanding every modern convenience and improvement. Immense sums of money have been invested in water systems, trolley lines, driveways and boulevards, public libraries, schools, churches, and everything that stands for the highest type of civilization. As already stated, many millions have already been added to the taxable wealth of the State, through the advent of the navel orange into California. It is claimed that this orange was originally a freak of nature. Whether this be true or not, it is certainly the highest type of citrus fruit.

In 1872 William F. Judson, United States consul at Bahia, Brazil, learned from the natives that a few trees were growing in the swamps on the banks of the Amazon, some sixty miles inland, bearing oranges without seeds. Being himself of a scientific turn of mind, and having some knowledge of orange-growing as followed in Florida, Mr. Judson believed that seedless orange trees were well worth experimenting with. He sent a native up the river to cut some of the shoots and to bring back some of the fruit. On receipt of them, with which he was greatly pleased, he sent six of the shoots, carefully packed in wet moss and clay, to the Department of Agriculture at Washington. These shoots did not excite as much interest in the department as Mr. Judson had expected. Two of the six trees died from lack of care in the department grounds, and the others were almost forgotten within a short time.

In the following year, Mrs. Eliza M. Tibbets, a native of Maine, was visiting in the family of General Benjamin F. Butler at Washington, then a Congressman from Massachusetts. Her husband had shortly before moved to California and pre-empted some land in what is now Riverside, intending to grow semi-tropical fruits. Through an introduction from General Butler Mrs. Tibbets sought of the Department of Agriculture fruits and shrubs suitable for experimental propagation in Southern California. Among other specimens she got from the department the four surviving orange-tree shoots from Brazil. These reached Mr. Tibbets at Riverside in December, 1873, and were immediately planted. One of the shoots died from neglect; another was chewed up by a cow.

Five years later the two remaining trees came into bearing, producing in the winter of 1878-79 sixteen oranges—the first seedless oranges ever grown in North America. These specimens were carried about Southern California and exhibited to the few fruit-growers then interested in orange-growing. The second crop was a box of oranges of better quality than the first. This spread the fame of the seedless orange, and ranchers from far and near went to Riverside to see the trees. Some were enthusiastic, others were doubtful. The feeling among fruit-growers of that period was perhaps well expressed in a statement made by ex-Senator J. E. McComas of Pomona. He said:

"I remember the time I saw some of the second crop of Tibbets'

seedless navel oranges. Several of us seedling-orange growers went up to Riverside purposely to see what truth there was in the statement that Luther Tibbets had trees that grew oranges without seeds. We looked the two trees over and over, and sampled the fruit, and wondered how it could be. Larger and juicier and more pungent fruit we had never known, but it all seemed so freaky that no one dared to risk several thousand dollars and six or seven years in trying to grow navel oranges for market. Moreover, none of us knew how to go at having a grove of seedless oranges, because there was no seed to start it."

Sure that there was a fortune in his new variety of oranges, Mr. Tibbets experimented for two years in an effort to propagate

SETTING OUT THE TREES.

trees from shoots and cuttings from his two seedless trees. These attempts were failures. Finally he hit upon the scheme of budding from the seedless navel trees upon seedling trees. These experiments were successful. So fine was the quality of the fruit, and so promising the returns, that the planting of navel orange trees budded from these original trees began in earnest in the early eighties. The demand for buds was so great that they sold for as high as $5 a dozen, and it is said that in some instances for $1 a bud. From this beginning has grown the enormous orange business of California.

Less than twenty-five years ago, as stated, the whole crop of seedless oranges in California was one box. From this small beginning the industry has grown until in a single year we have had over six million boxes of this most delicious fruit!

There are at this date probably 60,000 acres of orange orchards in California, chiefly navels, most of which are in bearing; and about 15,000 acres of lemons. This has been accomplished by the expenditure of many millions of dollars in water development and distributing systems and other things necessary to the development and maintenance of orange orchards.

The Los Angeles Chamber of Commerce, in estimating the value of the various products of Southern California, places the citrus fruit crop first, giving its value at $14,000,000 per annum.

During the period of ten years from 1892 to 1902, the product of our citrus fruit orchards increased from 1,325,000 boxes to 8,577,000, or an average increase of 23 per cent each year for the ten years. A similar increase in the total volume of fruit is likely to continue for some years to come.

This marvelous growth is evidence that the industry has been profitable. That it will be permanently prosperous there can be no doubt, unless the tariff wall should be broken down or some unforeseen disaster overtake it.

ORANGES IN THE SIERRA FOOTHILLS.

[From an article by J. Parker Whitney in Sunset Magazine. By permission.]

The orange tree may reasonably be considered the king of fruit trees. particularly in California, where the climatic conditions and prolific soil are more generally favorable than elsewhere.

It is unnecessary here to enumerate varieties, the object being to consider the navel orange and its commercial value. This orange—and especially the "Washington Improved"—may be admitted without discussion to be the first of all, by reason of its many superior qualities; being seedless and compact, of superior flavor, and possessing wonderful keeping qualities.

The first orange trees of which we have any record in California were set out at the San Gabriel mission, supposedly in 1804, by Father Thomas Sanchez, followed by others at Los Angeles in 1834, and by William Wolfskill in 1841. The first planting of a tree in Northern California was by Jesse Morrill at Sacramento in 1855. This tree from Acapulco seed was transported to Butte county by John Bidwell in 1857, and is still vigorous and bearing heavily. The first navel orange tree planted in the State was by Luther C. Tibbets and his wife at Riverside in 1873.

Some ten years after the planting at Riverside the navel tree moved north several hundred miles, reaching to Butte county and beyond, where it was found to flourish fully as well as in the

southern part of the State; but its value and adaptability to the foothills of the central and northern counties, though appreciated by the few, was not generally known until recent years. But the fact does exist most clearly and distinctly and beyond any possible controversy, that the orange in its variety can be most successfully grown for several hundred miles north of Tehachapi.

The region in the north adaptable for successful orange-growing is in excess of that south of Tehachapi. The orange ripens in the central and northern foothills from three to six weeks earlier than in the south. The explanation of this early ripening is the warm belt extending from north to south along the foothills of the Sierra Nevada mountains, where the average mean tempera-

A THRIFTY YOUNG ORCHARD.

ture, sixty degrees Fahrenheit, is about the same as in the orange grove region of the south, but warmer during June, July and August. The nights are warmer than those at groves near the seacoast.

The months of June, July and August are the most important ones of the year for the citrus fruits. The constant and greater heat in the foothill lands gives the orange great progress. Nor do the pests of black and red scale appear. Young trees from elsewhere showing scale, become healthful.

The navel orange, however favorable the latitude, does not reach its perfection on sea-girt islands, as shown by the products of Hawaii, Cuba, and even Australia. Although the navel orange is a semi-tropic product, it does not reach its perfection in a region

where the mean average temperature is much higher than sixty degrees. It is held by those familiar with the subject that so far as present experience goes, each region having its peculiarities, no region in the world exists, all conditions considered, that can compare with the foothills of California for orange culture.

The navel orange in Florida has been a shy bearer. The sweet orange now grown there somewhat extensively is from lands far south, as the more northern orange lands have been abandoned, owing to the severity of frosts and the cold weather.

The magnitude of future demand is hardly estimated yet, but it will have to be supplied almost wholly from California. The earlier harvest of the Sierra foothills is of immense value, as it will give it a priority in the markets.

The word isothermal has its application and definition in a supposed line of temperature over the surface of the earth, be it warm or cold, and is determined by careful observation as to mean annual temperature. California, commencing at the level of the sea, has mountain ranges of great height which reach to an average temperature of say forty degrees; other ranges of less height, to an average of fifty degrees; foothill districts with an average of sixty degrees, and some deserts on a level with the sea—and in some instances over a hundred feet below sea-level—where the average temperature is seventy degrees; so one finds regions of almost perpetual snow contiguous to those of tropical heat. Altitude does not wholly account for temperature, though affecting it; for currents of air, influenced by the sea and ranges of hills and mountains, effect an apparently abnormal condition in certain districts.

At the United States Weather Bureau a most careful daily record has been kept, extending over a series of years, of temperature, rainfall, and barometrical pressures. This has become very valuable for reference, and maps have been published annually of controlling factors, and lines of temperature have been clearly established, with corresponding rainfall, which have an important bearing upon agricultural and horticultural pursuits. It is fully conceded that the region in California most applicable for the successful growing of citrus fruits is where the average temperature is sixty degrees. Below that is found too cold, where destructive frosts occur; and above that, although some citrus fruits do well, there is a marked loss of flavor in the navel, which requires the particular elements of the average sixty-degree region of temperature to impart the peculiar tonic flavor. None but tropical lands are entirely free from frosts; even the southern desert land of the State, where the average temperature is seventy degrees, receives an occasional visitation. Some frosts are very light in effect, while the black frost, so called, which is hard and dry, is more damaging, and is more confined to the flat lands by the gravitation of cold air from the foothills, giving a remarkable feature favorable to the latter districts. Other foothill features result in the early ripening of oranges and consequent harvesting in October and November, avoiding the heavier frosts which occur

the latter part of December and in January, which occasionally do much damage to oranges in other sections. Oranges, when frost-bitten, are impaired in quality, and decay rapidly.

The State of California covers in latitude between 700 and 800 miles, yet the thermal belt of sixty degrees mean temperature, in its meandering course north and south, extends over a distance somewhat exceeding 1,100 miles, and a width varying from 5 to 20 miles. It should not be assumed that all of the land within the thermal belt is good land for orange-growing, but a large proportion of it is, comprising many hundreds of thousands of acres, where the fertility of the soil is unequaled and the supply of irrigation water is in excess of all possible demands. The

PICKING THE FRUIT.

isothermal belt of sixty degrees mean temperature enters California from Nevada on the east, at Mono county, extending southward into Kern county, where it somewhat abruptly turns and proceeds north through the counties of Tulare, Fresno, Madera, Mariposa, Tuolumne, Calaveras, Amador, El Dorado, Placer, Yuba, Butte, Tehama and Shasta. In the latter county, five hundred miles north of Los Angeles, it curves westward into Trinity and southward through Glenn, Lake, Yolo, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Benito, San Luis Obispo, and finally through Santa Barbara to the sea upon the west, having traversed or touched some thirty counties of the State.

The orange tree is peculiar among fruit trees in several respects. It is longer lived than any other excepting the olive, and although

its length of life in California has not yet been determined, it is found in other countries growing and bearing at an age of several hundred years. It can be taken up and planted in other spots suitable for it at any season of the year, whether in blossom or with growing fruit. More tender in its infancy than other fruit trees, it is stronger in maturity than many others, and while neglect for a period will destroy the life and value of many deciduous fruit trees, from which a renewal of vigor and bearing is impossible, the orange tree will revive, with care and attention, to a vigorous bearing state.

The navel, having no seeds, is budded on stock grown from other citrus seeds. It makes little difference what kind, seedling, the Mediterranean Sweet, the Tahiti, lemon or grapefruit. The latter is generally preferred from its supposedly stronger roots.

No tree is more prolific than the orange in bearing, its weight of fruit often exceeding that of its own wood and foliage above ground and its roots below. Any good citrus tree may be budded from any other citrus tree, be it orange, lemon, citron or grapefruit, and buds will grow and produce fruit strictly true to the tree budded from, without any strain of admixture resulting from the particular tree taking the bud. It is not uncommon to see an orange tree bearing both oranges and lemons as well as grapefruit.

California's foothill lands have not been planted long enough in oranges to show the remarkable yields noted by some of the oldest orchards in the Southern California region, where as high as one thousand boxes an acre have been harvested, but some exceptional trees are now yielding from ten to fifteen boxes to the tree. The net average weight of a box of navel oranges is sixty-five pounds, and three hundred and sixty-five boxes constitute the usual carload.

While the orange tree requires more care than perhaps any other, the methods are now well understood and are far in advance of those in vogue with the earlier growers and are not attended by any difficulties, but an eye to proper locality must be given as well as good soil and drainage. Irrigating water must be obtainable and must be regularly applied during the summer months, followed by cultivation of the upper soil.

The actual cost of plowing land thoroughly and planting the first year, followed by irrigation and cultivation, exclusive of land and tree cost, may be estimated at about $30 an acre. By the fourth year a well-managed orchard should pay all expenses of carrying on, and should each year after increase in its yield until a maximum of five or six boxes to the tree is obtained.

THE OLIVE IN CALIFORNIA.

By GEORGE C. ROEDING,
Chief of the Department of Horticulture.

The first olive trees to be planted in California were introduced about 1770 by the Spanish padres. As the padres gradually pushed northward the olive tree continued to be a part of their fruit gardens, its product forming not only an important feature in the culinary department, but having an additional value for use in their religious ceremonies. Some of the olive trees planted by the padres are still to be found at several of the ruined missions, and although receiving practically no care, they continue to yield fruit, bearing ample testimony to their longevity.

The Redding Picholine, deriving its prefix from the name of the introducer, was the first variety of olive sought to be planted extensively in California, it being claimed that it was valuable for both oil and pickles. Experience later showed that it was of no value for the last named purpose, as it was too small. In later years it was grafted over to more desirable varieties. As it adapted itself so well to our conditions, the future seemed to be full of promise for the olive business, and varieties were imported from Italy, Spain and France. Within a few years these were widely distributed over the State before their commercial value had been fully determined. The invariable result followed. Many growers found they had planted varieties which would not produce well, or which did not fulfill the recommendations of the introducer.

This has been the experience in all lines of fruit-growing in California. The novice always wants to plant a large number of varieties, believing that by so doing he will be assured of a crop, as all of them will not fail to bear. Instead of this being the case, there is never enough of any one variety to make it an object for a dealer to handle the crop. As a consequence, orchards in many instances have been uprooted and other varieties of fruits planted in their place.

Another serious drawback to the olive industry was the infestation of the trees in the coast counties with black scale. This pest has now been overcome by the introduction of the *Scutellista cyanea*, a small parasitic fly which lays its eggs in the scales, the larvæ later eating the scales.

The growers who have remained in the business and who have faith in its future have come to the conclusion that varieties adapted to either oil or pickling purposes are the ones to plant. The Mission olive (the one introduced by the padres) takes precedence over all others, and this is followed by the Manzanillo and Nevadillo Blanco. For pickling purposes alone the Ascolano, Obliza, St. Agostino, and Sevillano will no doubt receive more attention as the industry grows.

The last named variety is the one so extensively exported from Spain under the name of "Queen Olive."

Olives find conditions congenial to their successful culture as far south as San Diego, and northward under the very brow of Mount Shasta. However, the interior valleys and a good, warm foothill location seem to present conditions more favorable to the growing of the olive than the coast counties; the trees not only develop faster and produce larger crops, but the fruit averages larger in size and matures earlier, thus escaping injury from frost--a point which must have very careful consideration when olives are grown for pickling. It has been found that olives can not be grown profitably on rocky hillsides; but when planted in a deep, warm alluvial soil, they respond to good cultivation as readily as any other fruit. Where sufficient moisture is not supplied by the season's rainfall irrigation must be resorted to.

In Italy the seeds of a thrifty wild stock are planted, and when large enough are either budded or grafted. The trees are grown exclusively in pots, and it takes about six years before they are ready for the market. In California trees are sometimes grown in this manner, except that the seedlings are planted in the open, in nursery rows, and the budding or grafting is done there, with the result that trees are grown in just about half the time. The most popular method of propagating olives is to grow them from soft wood cuttings, which are planted in sand, either on the bench of a propagating house, or in flat boxes about four inches deep. These boxes are then placed on hotbeds under glass, and after about five months the cuttings commence to make root. The following season they are planted in nursery rows. A four-year-old tree has been found to be the most satisfactory for transplanting to the orchard. The trees should be planted about twenty-five feet apart. In former years closer planting was followed, but this was a mistake, and our horticulturists are becoming more and more impressed with the fact that better results are secured when trees are given more room in which to develop.

A properly pruned olive orchard presents a striking feature in our rural landscape; the green of the foliage is so distinct and unlike that of other varieties of fruit trees that the contrast is a most pleasing one. To begin with, the tree should be headed low, not over eighteen inches from the ground, and a systematic method of shortening in and thinning out of the lateral branches should be followed the first four seasons in order to develop a well-shaped, vase-formed head. The prevailing idea that an olive tree requires no pruning is erroneous, for without it the tree sends up a mass of straight shoots, which, if allowed to grow unchecked, will present a bare and unsightly appearance, and the only fruit-bearing wood will be at the tips of the branches, and there will be very little even of this. If the tree has been properly trained while young the pruning in later years will be an easy matter and the fruit-bearing branches will extend from close to the ground to the very top of the tree—an ideal condition.

An olive tree will commence to bear four years after planting, and will be in full bearing in about ten years. Twenty pounds of fruit is a conservative estimate at four years, and this will increase each season until the full bearing age, when one hundred and fifty pounds per tree is a fair average crop. The olive, unlike other fruit trees, does not bear with uniformity. It often happens that with two trees of the same kind and apparently of equal thriftiness, one will be loaded with fruit, while the other will have a light crop. The trees bloom in the early part of May, and when covered with their small white blossoms and prominent yellow anthers present a novel and interesting sight. If one-eighth of the fruit sets a big crop will be harvested. The blooming period is the most critical one, and

SORTING OLIVES.

although there is no danger from frost, a high wind or wet weather will very seriously affect the setting of the fruit.

Where conditions have been found to be favorable to olive-growing in California, crops are harvested every season. A failure of the crop is the exception. The harvesting commences in the warmer sections of the State about the middle of September. The green olives are picked at this time, the largest fruit being selected, and the most heavily laden trees are thinned out, as this hastens the maturing of the fruit. An overloaded tree will take fully a month longer to ripen its fruit than one which has only an average crop. Great care should be exercised in gathering olives for pickling purposes, for bruised olives will invariably go to pieces while being processed. The fruit should always be picked in baskets or buckets

lined with cloth or burlap. Olives for pickling purposes can not be harvested for less than $20 per ton.

No fixed rule can be laid down for pickling the olive, but one point above all others should be borne in mind, and that is not to penetrate the flesh too deeply with lye. Another great objection to our pickled green olives has been the lack of uniformity in color, and, when compared with the imported goods, dealers are justified in making this criticism. It has been intimated that the imported olives are colored chemically, but this, in the opinion of the writer, is not the case. The evenness of color is due to the use of limewater. This is easily made by dissolving about three ounces of lime to the gallon of water. After standing for about twenty-four hours the water is ready for use. In taking the limewater out of the receptacle it should be either siphoned or drawn off, so as not to disturb the lime which has settled to the bottom of the vessel. To each gallon of limewater add three ounces of lye, allowing the olives to remain in this solution until penetrated about a sixteenth of an inch. No further treatment with lye should be given. After being washed with clear water for a number of days, until all vestiges of the lye have disappeared, they should be immersed in a twelve-ounce brine by the saltometer, which strength should be gradually increased to twenty-four per cent. The olives are now ready to be barreled up and rolled away, and except for an occasional opening of the bung, to allow the gases which have formed to escape, and for adding new brine, if any should have evaporated, they will require no further attention. After six months of this treatment much of the bitter principle will be absorbed and the olives are then ready for market. Before marketing, the olives should be placed in a thirty per cent brine and the water used should be either distilled or boiled. Many of the large pickling concerns of the State do not bottle their goods until a year, or even two years, after they have been processed. This then, briefly, is the process for pickling green olives.

The method of pickling ripe olives is much the same, except that it is necessary to give them a second lye bath, the limewater being in this instance eliminated. The second processing is given more for the purpose of securing a uniform, dark luster in the olive than for any other reason, and as soon as the olives have reached this point the liquid should be drawn off. The after processing is much the same as for green olives. In picking ripe olives much care should be exercised to secure fruit which is of an even color. It is an utter impossibility, however, to have all the fruit alike. The processing will do much to secure this, and where it does not the olives must be hand-sorted. The keeping of ripe olives has been the problem above all others which the growers have had to face. The ripe olives being so much softer, difficulties not to be found in the green olive have presented themselves. Experiments in canning have been so successful that this will finally be the solution of this trouble, and canned ripe olives will, within a few years, be an article of trade just as much as canned peaches, pears, etc., are today. The

ripe olive, wherever introduced, has found more favor among consumers than the hard, woody, green olive, and now that the difficulty of keeping it has been solved this branch of the industry will unquestionably make rapid advances. There is as much difference in the flavor of a ripe olive, as compared with the green, as there is between a luscious, ripe peach and a green one. Not only this, but the ripe olive is a nutritious, delectable article of food, while the green olive simply serves as a relish.

Olives for pickling purposes sell for from $60 to $80 per ton, the price being regulated largely by the variety and size of the fruit.

Olives to be made into oil can be handled at much less expense than when they are required for pickles. When being picked for oil-making the fruit is either stripped from the trees, or knocked off with poles having a piece of rubber hose at one end, to prevent the branches being injured. A canvas sheet is spread under the tree and after enough olives have been gathered they are dumped into boxes. No precaution need be taken to prevent the olive from being bruised. Frozen olives make equally as good oil as those that are not frost-bitten, and the fruit can remain on the trees for a month or more before pressing and there will be no deterioration in the quality of the oil. Frozen olives have less water and consequently are more easily handled by the oil-makers. When the olives are received at the packing-house they are first run through a fanning mill or an aspirator, to remove all dirt and leaves. Leaves, even if left in, do not seem to impair the quality of the oil. The olives are next crushed by heavy iron or stone rollers revolving in a shallow iron pan, built something on the plan of a large saucer. This crusher may be run by horsepower, but in all modern plants the machinery is operated by either a steam or a gasoline engine; the former is preferable, as the steam can be used for cleaning the plant. In crushing, the pits as well as the pulp of the olive are reduced. It has been found impracticable to do otherwise, and the statement that has been made that an inferior article is produced when the pits are crushed is a fallacy, just as much so as that the virgin oil comes from the first pressing. This is good trade talk, but is never carried out in actual practice. The first pressing is usually light and the resultant product is largely water. Before making the second pressing the pomace is again crushed and then placed in a larger press, which exerts a pressure of about two hundred tons to the square inch. This is followed in some instances by another crushing and pressing. This last pressing is largely a matter of judgment on the part of the man in charge of the plant. The oil and water from the presses are run into settling tanks. Here the oil remains for from twenty-four to thirty-six hours, when it is skimmed off into storage tanks, where it remains until ready for use. These tanks are built of galvanized iron and hold from five hundred to one thousand gallons each. After the oil stands in the tanks for six months it is ready for bottling. If the grower can afford to allow it to stand undisturbed for a year it is better. The oil goes through a sort of fermentation during this time and

all impurities settle to the bottom. Before marketing the oil is filtered through several thicknesses of filtering paper to still further clarify it.

One of the most important features to be observed in an olive mill is cleanliness. Olive oil is a great absorbent of bad odors and soon becomes rancid if care is not exercised in its manufacture. A ton of olives will produce from thirty-five to forty gallons of oil. When ready for market the oil is put up in half, one and five gallon tins; also in half-pint, pint and quart bottles. It retails for $2.50 per gallon, and quart bottles are sold for from 85 cents to $1, the price being largely regulated by the size of the bottle used.

California oil-makers take great pride in the purity of their goods and the oil can be relied upon as strictly pure. Oil olives sell for from $30 to $40 per ton. This is not a very remunerative price, to be sure, but olives used for this purpose are those which are small or defective and can not be pickled, so that making them into oil helps to clean up the crop. The great obstacle in the path of finding a ready market for pure oil has been the competition of the adulterated oils either imported from Europe, or prepared by jobbers who make it a business to mix the pure article with cotton-seed, peanut, and other vegetable oils. If our national fruit laws can be so enforced as to compel those engaged in this nefarious practice to label their bottles, showing the true content, it will do much toward building up a business in California. If properly advertised, olive oil for medicinal purposes alone would be in great demand, for it will do more good to poor, suffering humanity than all the nostrums so universally used and so vigorously pushed to the front. Advertising and putting up a thoroughly good and reliable article will do more to build up the business and develop it than any other one thing that can be followed.

The annual output of olive oil in California is in the neighborhood of 150,000 gallons; green pickles, 150,000 gallons, and ripe pickles, 80,000 gallons. The importation of olive oil for the fiscal year ending June 30, 1903, was 1,250,823 gallons, valued at $1,557,517, and of pickles 2,115,844 gallons, valued at $770,194.

California fruit-growers are persevering; they have overcome difficulties in other branches of the industry. Have we not every good reason to believe that they will be equally successful in the development of the olive business? We have not only our own market open to us, but there are also other countries where the charmed name California will cause the gates to be opened wide to admit this great health food from our sunny clime.

VITICULTURE IN CALIFORNIA.

By CHARLES BUNDSCHU.

Few countries or subdivisions of countries are more lavishly endowed by nature than the State of California. Its great possibilities are manifested in all its various agricultural products, but they are particularly demonstrated in its viticultural propensities when compared with the limited demarcations of other wine-producing countries. In its vast expanse of about 750 miles along the Pacific Ocean, with an average width of 200 miles; with its irregular divisions and innumerable valleys and elevations; with isothermal lines inclining, contrary to the general rule, in a northerly and southerly direction, the geographical and topographical exposition of California embraces such a diversity of climatic conditions that grape culture may be successfully directed over a vast area within its borders for vinicultural purposes.

In a general way California has already demonstrated and classified, by energetic experiments and by subsequent experiences covering half a century, the leading characteristics and some of the preferable locations, exposures and soils on hillsides and in valleys. Still new districts are being continuously disclosed and the immense possibilities of California as a viticultural miracle are bound to attract the attention of the entire world. The long stretch of the coast counties, from Lake down to San Luis Obispo (embracing Sonoma, Napa, Yolo, Solano, Contra Costa, Alameda, San Mateo, Santa Clara, Santa Cruz) has evidenced for years its special fitness for the production of the most delicious and exquisite types of dry table wines. Under the influence of the cosmopolitan experience of some of the foreign-born viticulturists the selection of vine-stocks includes the best assortment of the most successful wine districts in the world. Every noted variety of wine grapes belonging to the famous order of the *Vitis vinifera* class has been introduced and propagated in California. Thereby most remarkable results have been attained in the production of the highest types of dry wines in the northern districts. In all the coast and bay counties the prevalence of sufficient moisture in the atmosphere during the summer months favors a uniform ripening process of the grape. The management of the vineyard estates is rational and more expensive than in the valley districts, especially where the finest varieties of Rhenish, Burgundy, Medoc and Sauterne types require high staking and intelligent pruning.

The great valleys of the Sacramento and the San Joaquin, and south of Tehachapi, reaching out in almost endless stretches between the Coast Range and the foothills of the Sierra Nevada, are the great sweet wine and brandy (and at the same time raisin)

emporiums of the Golden State. From Tehama, Colusa, Sacramento, Yolo, down to Merced, Fresno, Kings, Tulare, Los Angeles and San Bernardino, the generous, rich and full-bodied types are being produced with remarkable success, challenging the famous types of the Old World into fair comparison. Wines with the full characteristics, flavor and aroma of Port, Malaga, Muscatel, Madeira and even Sherry (this most distinctive and precious type of wine) are ripened here and brought to a high degree of perfection.

Nature provides the foundation for magnificent results. Assisted by irrigation in the overheated valley districts, and supplemented by judicious fertilizing where the soil has been overtaxed and exhausted, she readily yields to laudable efforts to produce "wine that maketh glad the heart of man," wine that promotes and develops the instinct of true temperance, because wine, cul-

PRUNING THE VINES.

ture, refinement, sobriety and good cheer always stand together and are affiliated against alcoholism.

It may be a matter of regret and justifiable criticism that wine-producers and wine-merchants in California have not as yet successfully developed and adapted a specific original nomenclature for the designation of their products, and that they still cling to the classification of California Burgundy, Sauterne, Riesling, Chablis, Port, Sherry, Malaga, Maderia, etc. The reason for this may be explained, principally by commercial usage and trade conditions established all over the world, and by other natural circumstances. The vintner, deriving his product from a special Rhenish, French or Spanish grape, aims at the perfection of this vintage in this particular direction. Lacking any other appellation (which the simple name of his vineyard location would not intelligently supply) he adopts a standard designation familiar to the trade and to the consumer alike. This may change somewhat in time. More progress will be made; special locations and proprietors will become better known and their products more individually appreciated. The Old World, however, has established and accepted certain denominations for certain types. As long as the characteristics of the California vintages are analogous it will

be difficult to eradicate the once established designation of "California Burgundy, Port, Sherry or Sauterne," except, perhaps, by supplanting it with Sonoma or Napa Burgundy, Fresno or Los Angeles Port, Livermore Sauterne, etc.

The leading varieties of grapes cultivated in the dry-wine districts as the principal foundation of "Zinfandel," consist in a prolific, full-bearing red wine grape with a fully developed, fruity flavor and pronounced acidity (possibly originating from the Austrian variety "Zierfahndler"); however, all the progressive vineyards are supplemented by Malvoisie, Mataro, Grenache, Carignan, Mondeuse, Malbec, St. Macaire, Valdepenas, various specialties of Burgundy and Pinot, Gamay, Trousseau, Beclan, Bouchet, Cabernet, etc. The leading white-wine stock includes the Burger, various kinds of Chasselas, Gutedel, several species of Riesling, Traminer, Semillon, Sauvignon, Marsanne, Colombar, Folle Blanche, some varieties of Muscatel, Tokay and many others, whose vocabulary has often been slightly corrupted into dialectical uncertainties.

According to assessors' returns the area planted to grapes in the year 1902 covered 118,209 acres for wine grapes, 89,792 acres for raisin grapes, 22,674 acres for table grapes; a total of 230,675 acres, to which an increase of 15 per cent may easily be added up to date.

The investments in the State of California in vineyards, cellars and plants, cooperage, general installations, and stocks of wines carried for trade purposes, may fairly be estimated to cover nearly one hundred million dollars.

The ravages of the phylloxera and of the so-called "Anaheim vine-pest" have been gradually equalized by replanting on resistant stock and by the reopening of new districts. The vineyardists hail with satisfaction the interest shown by the United States Department of Agriculture in fostering expert investigation and by the establishment of federal experiment stations of viticulture in California.

The statistical data obtainable as to the total wine production of the State are not always fully reliable. However, the following figures give a fair illustration of our progressive development:

Year.	Wine.		Brandy.	
1864	2,000,000	gallons	20,000	gallons
1874	4,000,000	"	297,000	"
1884	11,000,000	"	383,000	"
1894	18,000,000	"	1,754,000	"
1902	43,000,000	"	3,564,000	"
1903	32,000,000	"	5,776,000	"

The yield of 1902 was one of the most prolific in the history of the country, while the vintage of 1903 was about 25 per cent less, but of superior quality.

Since the United States government concedes and controls the free use of grape spirit for fortification purposes, a considerable amount of the grape product is distilled into brandy, to be turned

back again into sweet wines for vinification. No grain spirits can be utilized for this manipulation.

The official returns of the sweet wine product for 1903 are as follows:

Port	7,261,100	gallons
Sherry	4,639,300	"
Angelica	968,700	"
Muscat and Malaga	773,700	"
Total	13,642,800	

Against 14,590,900 gallons in 1902 and 8,503,900 gallons in 1901.

Efforts to increase home consumption of the pure wines of California should be intelligently extended. Too rigid concentration and control of the product may curtail the effectiveness of distribution. Wise and judicious national legislation, protecting the absolute purity of American wines, checking unwholesome adulterations of our domestic as well as imported wines, providing methods of branding and labeling under true names and classifications, eliminating sophistication and imitation of brands—all this will have a beneficial influence toward creating public confidence and increasing the consumption. Clipping, for illustration, from statistical reports, we find the home consumption of wine in other wine-producing countries per head and per annum as follows: In France, 25.40 gallons, equal to 126 bottles; in Italy, 20.50 gallons, equal to 102 bottles; in Spain, 17.50 gallons, equal to 87 bottles; while in the United States, 0.31 of a gallon only is used, equaling 1½ bottles per head per year.

The area planted to vineyards in France amounts to 4,250,000 acres, and the yield of the vintage 1903 amounted to 938,000,000 gallons. In addition, France imports 159,000,000 gallons from other countries, and exports only 48,000,000 gallons; so the home consumption of the French population reaches yearly over one billion gallons of wine.

In this connection may be mentioned the praiseworthy efforts of the California Grape Acid Association, offering generous co-operation to the grape-growers of the entire State with a view to the possible diversion of the surplus of an extraordinary grape crop into new channels of usefulness, thus curtailing the dangers of overproduction. Their generous offer of $25,000 reward for a simple and profitable method of turning grape sugar into commercial grape acid has attracted the attention of many scientists in Europe and elicited many new suggestions on the value and usefulness of the grape as a food product.

A great deal of good, progressive and substantial work has been already accomplished in California. The installation of wine-making establishments is on the lines of modern technically improved systems, facilitating the handling of grapes, musts and wines on a large scale.

San Francisco, the greatest distributing and shipping center for viticultural products, has some of the best appointed wine storage-vaults in the world. Some of the leading plants represent

many million gallons under one roof. Large oval casks, of American oak and of from 3,000 to 10,000 gallons capacity, form the equipment. A few of them exceed even the famous "tun of Heidelberg" in capacity.

The receipts at San Francisco from interior vineyards and cellars during 1903 amounted to 16,262,000 gallons of wine and 514,000 gallons of brandy, while the shipments from San Francisco by rail and sea for the fiscal year ending July, 1903, aggregated 17,054,000 gallons and 55,748 cases of wine and brandy, most of it to American shipping points, although the trade of Central and South America, Mexico, the Orient and Europe absorbed 2,500,000 gallons, with a continuous healthy advance. Next to San Francisco the city of Los Angeles is the important shipping point for sweet wines and brandies, while other California wine centers, such as Fresno, Stockton, Sacramento, St. Helena, Sonoma, Santa Rosa, Asti, Cloverdale, etc., are also furnishing their proportionate shares for direct transcontinental rail transportation to Eastern distributing points.

In conclusion, it might be stated that we may well be satisfied with the result of the pioneer work of the first half-century of California viticulture. May it never be forgotten that the unquestioned purity of the juice of the grape, the honesty and integrity of wine-maker and wine-merchant, are the only dominant and potent factors for ultimate success in this one of California's greatest industries. We are proud to proclaim to the world that these conditions exist in our State, and we are gratified to have an opportunity to demonstrate at the World's Fair in St. Louis, at our "Louisiana Purchase Exposition" of 1904, in the accumulated form of a joint state exhibit, the achievements of the harmonious, progressive spirit of viticulture in California.

RAISIN-GROWING IN CALIFORNIA.

By D. D. ALLISON,
Treasurer of California Raisin-Growers' Association.

In this article it is not the intention to give extended statistical information, but more particularly such data as are likely to interest intending settlers who may desire to engage in the viticultural business (the production of raisin grapes in particular).

The total bearing acreage in Muscatel and Muscat of Alexandria vines in California approximates 70,000; and vineyards are being set out every year.

Previous to the year 1898 growers would haul their raisins to independent packing-houses, and have them consigned through

the packer to be sold on commission. This plan became so unsatisfactory to the producers of raisins that they organized under the title of "The California Raisin-Growers' Association."

Under this plan all raisins delivered to the association are packed under the supervision and control of a board of five directors, who are elected by ballot at each annual meeting, each member being entitled to but one vote, irrespective of the number of acres he may own or control, by that means preventing the control of the association concentrating in the hands of a few large growers.

It is admitted by all concerned that the formation of the association was the means of firmly establishing this great industry. After the initial years of unsuccessful labor and investment the industry has become profitable and satisfactory, and it is the opinion of the writer, and of others better able to judge, that there is no danger of any permanent overproduction.

It is not to be presumed that advertising is advocated for the purpose of calling attention to the fact that the raisin is a food article, or that, as a food article, it is superior to other cured fruits. The old custom of the housekeeper, restaurant or hotel proprietor purchasing whole raisins to be used by the culinary and pastry cook has become obsolete. In its place there is now what is known as the California seeded raisin.

During the latter part of August or the beginning of September raisin grapes are generally ripe enough to be picked. Picking usually commences when the sugar test registers twenty-four per cent by the saccharometer. Having satisfied himself on that important point the vineyardist makes arrangements for the pickers. The pickers take two rows of vines apiece for convenience, and, in a squatting position, with a small knife they dexterously sever each bunch of grapes from the vine, laying it carefully on the tray, placing all the stems in the same direction. After the picking is finished the trays of grapes are left between the rows of vines to be dried by the sun, and herein lies the particular advantage of that section of the San Joaquin valley composed of the counties of Fresno, Kings, Madera and Tulare. In order to successfully evaporate the moisture contained in the grape when picked it is necessary for the fruit to be exposed to as dry a heat as possible. In the counties mentioned above, situate in the heart of the San Joaquin valley, the sky is cloudless the greater part of the year, and the humidity is at a minimum. The United States Weather Bureau records show as low a percentage of humidity as six per cent. Such a low percentage is almost unheard of in any other portion of the globe, which is the reason why the excessively high temperature does not affect human health or comfort. In this locality, when the temperature registers 110 degrees, which it occasionally does during an excessively hot wave, the effect is not at all similar to that produced by the hot waves so often experienced in the states east of the Rocky mountains. Sunstrokes or prostrations from heat are entirely unknown, and no matter how hot the hours of sunlight may

be, it rarely happens that a refreshing cool breeze fails to blow throughout the night.

The average time required to dry the crop is about three weeks. The grapes are left on the trays for about fifteen days (according to the degree of temperature), and then turned by placing an empty tray on top of a full one, and by a dexterous turn reversing them, leaving the grapes with the undried side exposed to the sun. They are allowed to remain in this position until dried, usually taking six or eight days. The trays are then stacked in piles of from twenty to thirty, where they are left to go through what is termed the sweating process. After a few days the raisins are ready to be transferred to the sweat-boxes, generally holding about one hundred and forty pounds to a box, and then hauled to the nearest packing-house to be stemmed.

Arriving at the packing-house the raisins are weighed, and are thence trucked to the stemming machine, where the stems are separated from the raisins; the latter being carried by an endless belt and run over different sized screens, which grade them in sizes. They then run through spouts into boxes, holding fifty pounds each. If to be shipped as loose raisins, the boxes are immediately nailed up ready for shipment. If to be placed on the market in the form of seeded raisins, they are transferred to the seeding plant (although only a recent invention, no packing-house is now considered complete without such a plant), where they are placed in a drier, and all moisture thoroughly evaporated. It is necessary to have them perfectly dry and brittle in order to remove the capstem from the end of each raisin, and also remove every particle of dirt or dust. From this machine they are transferred to the steaming-house, where they are made pliable with steam so that the seeds may be removed without any unnecessary tearing or bruising of the berry. They are now transferred to the seeding-machine proper, where they are run between rubber rollers and carried under a row of miniature saws and punctured, and the seeds forced out by another mechanical appliance. Continuing on their journey, they arrive at the packing table, where they are packed in cartons weighing one pound each, thirty-six cartons being placed in each commercial case, in which condition they are ready for the market. It is only seven years since the seeding of raisins was first successfully accomplished, 300 tons being placed on the market in that year; whereas, in the year 1902, there was shipped from the seeding plants of Fresno alone a total of 22,000 tons. Such is a brief explanation of the manner in which seeded raisins are prepared for market.

We will now return to the vineyard, where the men are busily engaged in transferring the raisins from the trays to the sweat-boxes. It is generally profitable to pay the pickers an extra charge for sorting from the trays all large and fancy bunches, called clusters and layers, into separate boxes. These bunches are put up in fancy brands, viz, Imperial, Dehesa and Fancy Clusters and three- and two-crown London Layers, according to quality

or grade. For the finest clusters the vineyardist will generally receive two or three times as much as for the ordinary loose raisins. Since the introduction of seeded raisins the demand for the lower grades of layer raisins has diminished.

In addition to the grapes that are picked and converted into raisins there is usually what is termed the second crop, which ripens about a month later than the first crop on the same vines. This crop is seldom made into raisins, the bulk of it going to the wineries to be converted into grape brandy and for which usually a fair price is paid, frequently netting sufficient to pay for the curing of the first crop.

The work of harvesting the crop, etc., is usually completed by the first to the tenth of November, and you can then occupy your

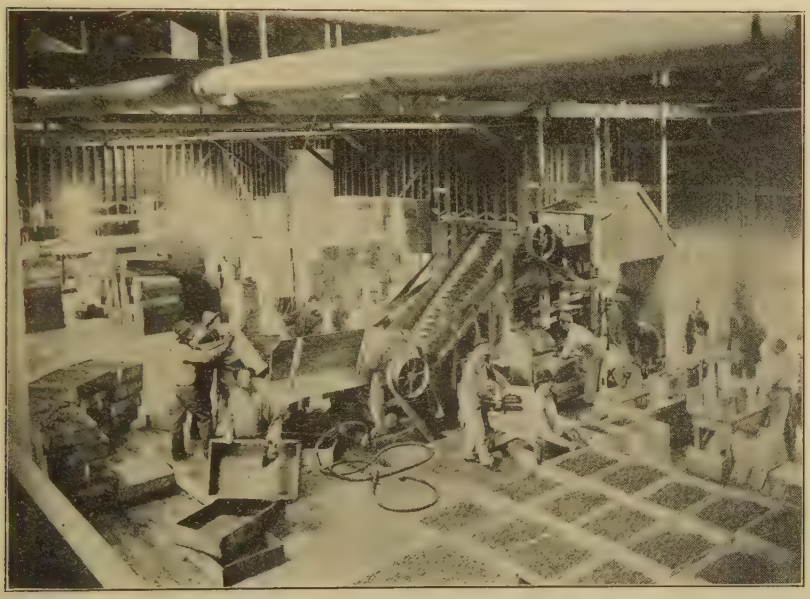
PICKING AND CURING RAISINS.

time as you desire until the following early spring, as there is little of importance to do until the time for pruning arrives, which is usually the latter part of January or the beginning of February.

The difference in the appearance of a California raisin vineyard before and after pruning is remarkable; for, whereas, prior to the foliage dropping, the canes usually reach six and eight feet from the body of the vine, making the vineyard almost a solid mass of green, after pruning the vineyard has the appearance of a field of dried-up stumps. On each vine has been left a few spurs, about two inches long, all the balance of the wood or canes having been cut away. It is hard for a stranger to realize that a field of apparently dry stumps can produce the crop of grapes in so short a space of time as they do in California.

After the pruning of the vines and burning of the brush are finished, plowing and cross-plowing are commenced, and then a thorough cultivation, leaving the vineyards in as finely pulverized and mellow condition as possible. Hoeing around the base of the vine, where the plow and cultivator can not reach, is then done, and next the suckers that have started are pulled off. If the vineyard is well taken care of and in a healthy condition there is little more to do until it is time to pick, except an occasional cultivation for the purpose of keeping the soil mellow and of checking any new growth of weeds that may start where the ground is unusually moist.

For the benefit of those who are not familiar with the principal raisin sections of California it may prove interesting, and even a



STEMMING AND PACKING RAISINS.

surprise, that the average rainfall is less than ten inches per year. The rainfall during the ten months ending March 1, 1904, was only four inches; and yet, vineyardists did not worry, for, so long as nature stores its water supply on the summit of the mountains in the form of snow, they realize that there is no occasion for alarm.

Prior to the year 1875 the vicinity in which this article is written was a desert the greater part of the year; the pasturing of sheep and cattle for three or four months of the winter and spring being the only use to which it was put. It was not until irrigation was adopted that the wonderful fertility of the soil became known. Then was commenced that stupendous system of irrigation which has been the marvel and admiration of the world, and which has transformed a waste into an amazingly fruitful region.

Previous to the inauguration of irrigation one would have to sink a well from forty to sixty feet before striking water, whereas, at the present time water can be found a few feet from the surface, the soil having become saturated with the seepage from the many irrigation ditches.

It is not the intention nor the desire of the writer to convey the impression that, having secured a tract of land for a vineyard, or having purchased one already planted, responsibility and care cease. On the contrary, it requires energy, attention, intelligence and patience to make an investment in a raisin vineyard profitable. Nature does a great deal for the tiller of the soil in California, but to reap satisfactory returns from an investment in her lands close attention must be devoted to every detail.

To the intending settler the writer will offer the following advice—and it is for those of limited means that this article is more particularly intended: Do not be in too great hurry to invest; take time to investigate the adaptability of the soil to your requirements. Be patient, and endeavor to gather information from those having practical knowledge in the particular branch which you intend to follow. If your means are limited, and you do not feel above gaining knowledge from practical experience, make up your mind to work on a vineyard for a time. You will thus not only gain a knowledge of the method of caring for a vineyard, but you will discover that the men with whom you come in contact in the ranks of hired help are sometimes better informed as to the matters which you desire to know than are some of the men who own thousands of acres.

As already stated, the estimated number of acres planted to the raisin grape in the State of California is 70,000. They are owned by about three thousand individuals. In this estimate there is to be considered a large number of landowners who follow diversified farming.

The price of land in its natural condition varies according to location and quality. Land located near a town is naturally considered of more value than that at a distance, although the net returns may be less; and to an intending purchaser for agricultural purposes of any description, considering the usual difference in price, unless amply provided with means and not entirely dependent upon the returns of your investment, it would be advisable to purchase a similar quality of land at a less price per acre farther removed from town. Unimproved land suitable for vineyard purposes can be secured for from $40 to $100 per acre. After properly preparing the land and planting the vines it usually takes from three to four years for profitable returns; but by planting the vineyard by degrees and practicing diversified farming, a person can realize reasonable returns right along until the vines come into bearing.

The best guide for a stranger as to whether a particular locality is prosperous is to note the condition of its public buildings, school houses, churches, banks, public library; its streets, street-

car service, railroad facilities, and its residences; and in driving through the surrounding country note if the school facilities are ample, and if the houses are neat and attractive; also, if the general surroundings have an air of thrift. If, upon taking note of these points you form a favorable opinion, you may conclude that it is a safe section in which to invest and to make your future home.

In the San Joaquin valley are to be found vineyards of from five to one thousand acres, in the highest state of cultivation, without a weed in sight and every row of vines in perfect alignment and every plant of uniform size, giving one the impression that it is an immense garden instead of fruit fields maintained for profit. Whether of large or small acreage you will invariably find the vineyards and orchards equally well taken care of in every particular.

Some who read this article may have had their attention called to some particular instance of phenomenal yield that has been published through the newspapers. Such articles are oftentimes misleading. The writer of this article can quote like instances that would hardly be credited, yet which, notwithstanding they would be absolutely true, would be entirely misleading.

This article has not been written for the purpose of booming any location or section of California, nor to advertise any tract of land. On the contrary, it has been written for the sole purpose of giving reliable and trustworthy information to intending settlers, those who from choice may desire to engage in the raisin industry—the same advice that the writer would desire should he be looking up the advantages of a place with which he is not familiar. It needs no exaggeration of facts to sing the praises of the productiveness of California's soil.

In conclusion, the writer will take the liberty of quoting from the Pacific Rural Press, published in the city of San Francisco, an answer to several questions propounded to the editor by one who signs himself "Minneapolis Skeptic":

"If the distant reader gets the idea that he, without any knowledge or experience, and perhaps without intending to do anything himself but to sit in the shade, can get out of the place every year as much as the outfit costs him, he had better bear the ills he has. If he comes, however, intending to apply ordinary business sense and energy, and expecting to receive a good return for his investment and labor, he is pretty sure to realize it—unless he is handicapped by a mistake in the beginning, such as may be made in buying poor land or planting the wrong fruit, or something of that kind. If Eastern people will read advertising matter like business men, and not stick their fingers in the fire like children and then cry at the sight of the flame, they will make better Californians and learn to appreciate the many advantages that the Creator has placed within the reach of those who live in the State of California."

THE FIG IN CALIFORNIA.

By GEORGE C. ROEDING,
Chief of the Department of Horticulture.

No fruit has appealed more to the horticulturist than the fig. It is easy of culture, adapting itself to a variety of soils, and the expense of harvesting is very light as compared with many other fruits. Naturally the great desire of growers of figs is to produce a fruit equal in flavor to the far-famed Smyrna variety from Asia Minor.

In the year 1880 the San Francisco Bulletin Company, backed by the late Senator Leland Stanford, made the first importation of fig cuttings from Asia Minor, and a few years later another shipment was made. These trees were distributed to subscribers of the Bulletin throughout the State. When the trees were old enough to bear, the fruit, after attaining the size of a marble, shriveled and dropped. Those who planted the trees concluded that they had been duped. Many of the trees were dug up and destroyed in consequence, although isolated specimens are still to be found, the largest number being on the Vina Ranch, belonging to the Stanford Estate. These trees were planted in out-of-the-way places and have received little or no care. The wily Smyrnaites evidently did all they could to prevent cuttings of the genuine commercial variety being exported, for the trees growing at Vina are badly mixed, consisting of a number of varieties. There are a few of the genuine commercial figs growing there, but they are the exception rather than the rule.

The next variety to attract attention was the White Adriatic, a Dalmatian sort, and it was extensively planted from 1884 to 1890. When the trees came into bearing and the fruit was found to be inferior to the imported figs, no matter how processed, growers concluded that Smyrna figs could not be grown here, conditions apparently not being favorable for their successful culture. Nevertheless, quite an extensive business was built up in Adriatic figs. The shipments are in the neighborhood of 2,500 tons annually. The jobbing trade in the Eastern States regarded California figs as a joke, and it was the consensus of opinion that California would never succeed in placing on the market a fig equal in flavor to the imported.

In the year 1885 F. Roeding, of the Fancher Creek Nurseries of Fresno, having come to the conclusion that none of the figs grown in California were of the same variety as the fig of commerce, decided to send his foreman to Smyrna to make a personal investigation and to secure cuttings of the very best varieties. After remaining a year in the nursery the first orchard, consist-

ing of twenty acres, was planted in 1887 from these cuttings. In addition to this, there were planted about forty caprifig trees.

The tree producing the caprifigs is necessary for the production of the Smyrna fig. Without caprifigs Smyrna figs can not be produced. It is in this one respect that the Smyrna type of figs differs from all others; for unless the female flowers of this fig are fertilized by the pollen of the caprifigs, the fruit shrivels and drops when one-third grown. In other varieties of fruits in which the flowers are exposed any ordinary insect can convey the pollen from the male to the female; but in the fig, all the flowers are inclosed, and it is only through the agency of a little wasp-like insect which makes its home in the caprifig that the pollination of the flowers of the edible fig can take place. The caprifig trees produce a succession of crops during the season, and for every crop of figs there is a new generation of insects.

The first caprifigs make their appearance in March, as soon as the new growth starts on the trees. These figs are in the receptive stage in the latter part of April. The female wasp, which is winged, enters this fig at this time and deposits her eggs in the gall flower, as it is called, and then perishes in the fig to which it has entrusted its offspring. This fig reaches maturity in the early part of June, and at this time the male, or staminate, blossoms are mature and covered with pollen. There are both male and female wasps, each doing its share in carrying on the work to a successful completion. The male wasp issues first from the galls, crawls (it is wingless) around in the fig, locates the galls in which the females lie, cuts into them with its powerful mandibles, and impregnates the female. The female enlarges the opening made by the male, crawls out of the gall, and then passes through the orifice of the caprifig, which is then large enough to admit of an easy exit. In leaving the fig its body and wings become covered with pollen from the male flowers, which occupy a zone in the fruit immediately surrounding this opening. This is one of the most interesting phases in connection with the growing of Smyrna figs. The caprifigs at this time are plucked from the trees, threaded on reeds or raffia fiber, and suspended in the Smyrna fig trees. The female flowers of the Smyrna fig are in the receptive stage at this time, and the little wasp forces its way through the almost closed orifice of the fig, in many cases breaking off its wings in its eagerness to make an entrance. It crawls around in the fig, passing over the numerous female flowers, trying to find a place to deposit its eggs. The flowers are so constructed that it can not do so. The insect, although prevented from carrying out its object, proves a benefit to mankind, for every fig entered matures into a luscious fruit, with fertile seeds. A few days after an insect has entered, the fig commences to develop and expand, assuming a bright, healthy and vigorous appearance, while the figs which the insect has not penetrated have a sickly, yellowish-green color, and soon drop to the ground. The insect, after performing its function, leaves the fig and dies.

The question now arises as to the manner in which the insect perpetuates its species. All of the caprifigs are not picked from the wild or male trees, as they are often designated. A few of the late maturing ones of this crop are allowed to remain, and from these the female insect issues and passes into the new crop of figs appearing on the same tree. Here it deposits its eggs in the gall flowers, and thus provides for a new generation of wasps. When this crop is mature, which usually takes six weeks, another crop of figs appears on the wild fig trees, which the insect enters. The final crop, which makes its appearance the latter part of September, remains on the trees all the winter, the insect remaining in this crop in the larva form until the spring crop, already

PACKING FIGS.

referred to, commences to develop. This, then, briefly describes the life history of this wonderful little insect, around which the success of a great and important industry centers.

The only season in the year in which the caprifigs are distributed in the Smyrna fig trees is in the month of June. Two or three distributions are made at this time, at a cost, even in an old orchard of ten to fourteen years, not exceeding $1 per acre. From six to ten figs are placed in a tree at each distribution of the caprifigs, the number varying according to the size of the tree. Each caprifig contains from three hundred to one thousand insects.

The Smyrna figs commence to ripen from the middle to the latter part of August, and continue until October 1st. The fact that these figs do not all mature at the same time is a very important

feature and one which will appeal to every fruit-grower. It means that a very large crop of fruit can be harvested with a small force of men, or even children, at a minimum expense. These figs must not be picked from the trees, but allowed to drop to the ground of their own accord. This they will not do until they have shriveled and lost their form. Occasionally a fig will be seen which does not drop readily. A slight jar to the tree, or tapping the fig with a light bamboo pole, will cause it to fall. The figs are gathered in small buckets, and later are taken to the drying ground in picking-boxes. Before placing the figs on the trays they are immersed for half a minute in a boiling hot brine containing about three ounces of salt to the gallon of water. After a few days' exposure to the sun they are taken to a room sealed tight with tongue-and-grooved lumber, and placed in a large pile. Here they remain for ten days, being turned occasionally. This sweating, as it is termed, equalizes the amount of moisture in the fruit; overdried figs absorbing moisture from those which are too wet, and vice versa. Before the figs are taken to the packing-house they are washed in a weak cold brine; the overdried figs, called floaters, are removed as they float to the top, and the others are given a good rubbing between the hands. This removes the dirt which may have gathered on them in the course of drying. After exposure to the sun for a half-day, to allow the superfluous moisture to evaporate, they are dumped into boxes and hauled to the packing-house.

The packing is done by women and girls. Every effort is made to have the fruit in the best of condition and perfectly clean. Just prior to being taken to the packing-table the figs are given a steam bath. This cleanses them thoroughly and heats the fruit through, and should any insect have laid its egg in the fruit during the course of drying, the germ is destroyed. No such care is exercised by either the growers or packers in Smyrna, and in consequence the imported figs are sometimes not only wormy, but dirty as well, due to the crude manner of handling. The figs are packed in pound and half-pound paper cartons, which are in turn packed in wooden boxes holding ten pounds each. So much for our method. Contrast it with the method followed in Smyrna.

The Fig in Smyrna.

There the figs are dried on rushes, on an open place in the orchard where a few trees have died. When sufficiently dried the fruit is dumped on the ground in any convenient old shed and allowed to remain until enough has accumulated, when it is gathered in horsehair sacks holding about two hundred pounds each. These sacks are very strong and quite expensive, and are very desirable for the transportation of figs, for they have no lint like burlap sacks. These figs are carried on the backs of camels to the nearest railroad station, a camel-load being two such sacks. A camel train usually consists of from six to ten camels. It is quite a novel sight to see these ungainly creatures shambling along with their big loads, the caravaneer riding in the lead on a small donkey, perched

high on a peculiarly elevated and ungainly saddle. During the season the Ottoman railway, which traverses the entire fig district, sends trains daily from the most important points in the Meander valley, and it is no uncommon occurrence to have from 1,500 to 2,000 tons of figs delivered in Smyrna in a single day. All of the fig-packing is carried on in Smyrna, a city of 400,000 inhabitants and located on the coast about forty miles from the fig districts. The figs, on reaching Smyrna, are again conveyed on the backs of camels to the fig bazaar, or to the packing-houses if they have been sold to any particular packer. They are dumped on the floor in immense masses about three feet deep. Before packing the figs are sorted into sizes and suppled by women and girls, who receive fifteen to twenty cents a day. The packing is done entirely by men. Neither men nor women are any too clean about their person. A Smyrnaite never eats packed figs. You ask him why, and a shrug of the shoulders is your answer. The only time water touches the figs is when the packers moisten their fingers in the sea water, which is hauled in hogsheads from the quay, into which all the sewers of Smyrna empty.

It is a well-known fact that all imported figs are wormy. Most of the worms leave them while they are in transit, and it is rare that the consumer sees any of the worms in the figs he is eating. It is generally supposed by the packers of Smyrna that this worm is a natural product of the fig, resulting from an egg laid by the fig wasp. However, this is entirely incorrect, for the worm comes from an insect laying its eggs in the fruit during the process of drying.

Commercial Value of Figs.

To produce a good article is always a source of satisfaction, but there must be another incentive. The industry must be profitable. No business can succeed or make any advance unless it pays. The question arises, Will fig-growing in California pay? True, we must compete with the cheap labor of Europe, but this has been the fact in other branches of fruit-growing. We are competing in many branches, and our fruit sells in competition with the best that is produced in the Old World. Although our wages are much higher it must be remembered that our help is more efficient, and this, combined with the advanced methods of handling, places us in a position to compete in figs as well as in other fruit.

It has been demonstrated that Adriatic figs at three cents a pound are more profitable than raisins at five cents. Smyrna figs can be raised fully as cheap as Adriatic figs, the only additional expense being caprification; but as this does not cost over two cents a tree at the very outside, it is a matter not worthy of consideration. It is safe to assume that Smyrna figs, even when produced in large quantities, will never bring less than three cents per pound, and for many years to come five cents per pound will be a more likely average. No class of dried fruit outside of the fig possesses so many dietary qualities, and with a good article on the market, there is an unlimited field for expansion. With the

figs which were being marketed from this State prior to the successful establishment of the Smyrna fig industry there was no hope for the future. It is now conceded that this trouble was due to our not having the right variety and to no other cause. It does not indicate, because a fig is of the Smyrna type, that it necessarily is the variety for drying, any more than that one of our June peaches is a good drying or canning peach. Thus far there has only been one variety of any value for drying purposes, and this has been designated as the "Calimyrna." This is the identical variety grown in Smyrna under the name of "Lop Injir," which is the only fig used for export. The name "Calimyrna" is copyrighted, and is a contraction of the two words "California" and "Smyrna." The name Calimyrna has already made its impression on the trade, and is recognized as the only fig grown in California worthy of being classed as a true commercial product.

Fig Land in California.

There are thousands of acres of land in California, in the interior valleys, in which this fig can be grown successfully and profitably. True, the fig will grow any place in the State where the temperature does not go below eighteen degrees Fahrenheit. As a commercial proposition it must have a dry, warm climate during the summer months, and it will therefore always find its most congenial location in the Sacramento and San Joaquin valleys, and in the foothills where such conditions exist. The trees will grow on either wet or dry soils, but a deep, warm soil with good drainage will always produce the best fruit. No orchard can be raised with so small an expense as a fig. Good cultivation is of course important, but outside of this and irrigation, the other expenses are very light. Pruning is a small item; no spraying is necessary, for the trees are never subject to attack by insect pests.

The importation of figs into the United States amounts to over $800,000 annually. This alone demonstrates that there is an opening for the development of this industry. There is no fruit which can be put to such a variety of uses as the fig, and the demand for this fruit canned or preserved has never been satisfied, even with the ordinary figs.

THE FORESTS OF CALIFORNIA.

By W. H. MILLS,
Chief of the Department of Forestry.

The following sketch of the forests of California is intended as an introduction to the classified forest exhibit of California made in the Department of Forestry.

At best, a forestry exhibit is an exhibition of specimens of wood. Paramount consideration may be given to the botanical or scientific aspect of the forests of a country, or the commercial significance of these forests may be illustrated. But whatever the paramount motive for the exhibition may be, no exhibit which would adequately represent the forested condition of a country can be made in the space allotted to such exhibits in expositions.

A forest covering a hundred thousand acres of land might contain a variety of tree growth as great as one containing as many millions of acres. The same commercial woods might be found in a very limited forest area as in one covering millions of acres.

The California Forestry Exhibit is distinctively commercial in its motive and aspect. The scientific or botanical exhibit might have been combined with this, but such an exhibit would have required a very large space for its display and many years for its collection. That no complete scientific exhibit of the forests of any country has ever been made is a justifiable assertion. Germany, where the science of forestry has attained its ripest stage, notwithstanding the appearance of that empire in all the great world's expositions, has not even attempted a botanical or scientific expression of its forests, nor disclosed to the world the advanced policy which has given to that empire thirty-five millions of forested land with all the attendant meteorological and climatic benefits.

Notwithstanding the difficulties which can readily be anticipated, it was the original intention of California to make the World's Fair at St. Louis an occasion for a comprehensive exhibition of the forests of California, presenting their botanical aspects, the topographical expression of the forest floors, the rainfall, and the relation of the forested flanks of the mountains of the State to the level agricultural areas which lie at their feet.

The desire to accomplish this result was due to the unsurpassed forest wealth of California, including the wide range of varying botanical specimens, the vast magnitude of its commercial values, and the distinction which the forests of California enjoy by the possession of species unknown to other countries, which, coupled with the scenic grandeur of the densely wooded slopes, densely forested canyons and park-like plateaus, all combine to invest the

forests of California with intense interest to the botanist and sylvaculturist.

Such an exhibit, however, would have involved a larger expenditure of money than was available for this purpose, and a larger exhibition space than could reasonably be expected at the hands of the exposition authorities. The scientific aspect alone, to possess any value, must be accompanied by a complete exhibition of botanical specimens, and these would possess but little interest to the average spectator unaccompanied by a catalogue, which of itself would expand to the dimensions of a volume on the science of botany.

The exhibit has been collected and installed in accordance with

PLATE NO. 1—HEAVY FORESTED DECLIVITY,
Showing large growth on steep inclines of river canyons.

the plan of taking the leading commercial species and presenting them fully. It was found impracticable to make a complete exhibition of all the tree growth of California possessing commercial value. To illustrate the impossibility of an adequate scientific exhibition, the facts relating to the pinus family may be adopted.

The genus of forest trees known botanically as "pinus" comprises eighty classified species; these are distributed over the North Temperate zone in both hemispheres. Of the eighty classified species only twenty are found in Eurasia, a geographical designation given to a region extending from the Atlantic Ocean to the Pacific across northern Europe and Asia, a distance of nine thousand miles east and west; while sixty of the eighty known

species are found in North America, extending over a region of only three thousand miles east and west. Of these sixty, twenty-five are found on the Pacific slope west of the Rocky mountains. Of these twenty-five, twenty abound in the forests of California. California, therefore, possesses as many species of the pinus family as all Europe and Asia combined.

Of the sequoia, which may be said to be indigenous and peculiar to California, we have but two classified varieties—the *gigantea* and the *sempervirens,* or in common parlance, the "big trees" and the "redwood." Every commercial aspect of these two varieties of sequoia is fully presented in the forestry exhibit of California. These include some beautiful and striking cabinet forms

PLATE NO. 2—MIDDLE ALTITUDES OF SIERRA NEVADA MOUNTAINS.

which illustrate the use of the wood in public and domestic architecture; also broad planks, which indicate the ponderous growth of the trees.

To understand the forests of the State of California, the topography of the State must be described. California is essentially a mountainous state. It comprises one hundred millions of acres of land, and of this about thirty millions are suitable for cultivation; this leaves about seventy millions of acres comprising the densely forested areas of the State, unirrigated deserts hereafter to be reclaimed, and the high peaks of the mountain ranges which rise above the timber line. Interspersed with the mountain land there are valleys of varying extent in the coast region of the State, and other valleys of more or less significance in the great Sierra

Nevadas, which form the high east wall of the State of California, and constitute an insurmountable barrier to the climatic conditions of the North Temperate zone which prevail from their summits to the Atlantic Ocean.

California is distinguished from all other countries by the possession of two extensive valleys of fertile plains completely surrounded by mountains; these are the valleys of the Sacramento and San Joaquin rivers. They lie in the very heart of the State, and have a length north and south of six hundred and fifty miles, with an average width east and west of approximately thirty-five miles. These statements are intended merely to cover the average width, and not to express the greatest or least diameter of the ellipse.

PLATE NO. 3—DENSELY FORESTED AREA COVERING MOUNTAIN PLATEAU.

The two valleys comprise approximately fifteen millions of acres of land, being fifty per cent of the arable area of the State, and possessing at least seventy per cent of its fertility and productive capacity.

From the mouth of the great canyon of the Sacramento valley on the north to the summit of Tehachapi on the south, a distance of six hundred and fifty miles, there is a continuous fertile plain, sometimes reaching a width which reduces the mountain ranges on either hand to the appearance of lowlying blue ridges rising above the horizon.

To the eastward of this immense plain, the western escarpment of the Sierra Nevada exposes one continuous succession of splendid forests. Passing Tehachapi to the southward, these forests disap-

pear; passing Redding, at the mouth of the Sacramento canyon on the north, the forests close in from the Sierra Nevada and Coast Range systems, and the full breadth of the State is practically a forested country.

Around the great fertile basin comprising the interior valley of California already described, there is a complete enclosure of mountains. The Coast Range to the west is wooded on its western slope and the Sierra Nevadas on the east are also wooded on their western slope and, in some measure, beyond the summits to the eastward.

The area covered by the density of tree growth worthy of the designation of "forests" comprises twenty-two millions of acres.

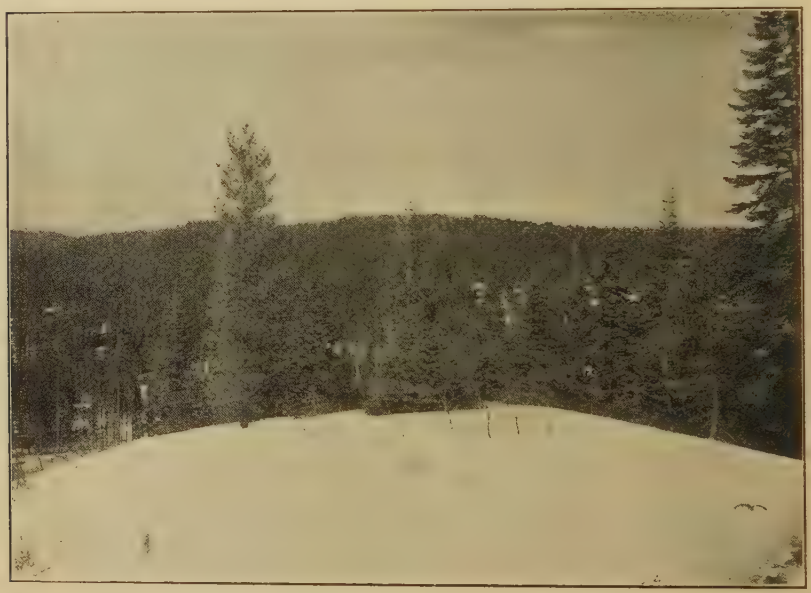


PLATE NO. 4—FOREST OF FIR IN HIGH ALTITUDE.

Of these, approximately eight millions of acres belong to the Coast Range system and consist chiefly of redwood, while the main forest of the State, covering the western flank of the Sierra Nevadas, comprises sixteen millions of acres and consists chiefly of pine and fir. With the exception of small portions of the redwood districts, there are no "pure forests" in California.

The most valuable commercial wood of the State is the sugar pine. The trees of this species attain a diameter of twelve feet and more and are not infrequently three hundred feet high. The wood is white, with fine, strong grain capable of receiving a high finish, is entirely devoid of resinous substances, and is in all respects the most valuable pine timber known. Its habitat is the middle altitudes of the Sierra Nevadas. It is seldom found below

thirty-five hundred feet above sea level, and very seldom above an altitude of six thousand feet. There are no pure forests of sugar pine.

Some portions of this forested area are richer in this valuable wood than other portions, but the species is always accompanied by other species, and the twenty species of pine already mentioned comprise about seventy-five per cent of the forest trees in the State.

Of the pines, four species have prominence, viz:

1. Sugar Pine *(Pinus lambertiana).*
2. Silver Pine *(Pinus monticola).*
3. Yellow Pine, now called White Pine *(Pinus ponderosa).*
4. Black Pine *(Pinus jeffreyi).*

PLATE NO. 5—THE BLENDING ZONE BETWEEN SUMMER AND PERPETUAL WINTER.

A conservative approximation of the quantity of merchantable lumber standing in the forests of California reaches the vast total of four hundred and forty billion feet. Since the forests of California are found in the mountainous districts of the State, the topography of the floors of these forests possesses interest. Topography is the controlling factor in the economic production of lumber from California forests. These forested lands are divided into hydrographic districts. In the commercial aspect of the subject, the catchment area of a system makes all the forests grown upon it tributary to the canyon line which constitutes the central drainage of that hydrographic area. In the parlance of the lumbermen, the lands in a single drainage area can usually be "worked together"; which means that the instrumentalities of bringing the

logs to the mill and the lumber to trunk lines can be brought downward to the central line of drainage, and the construction and maintenance of these instrumentalities is very costly. The profit of lumbering is, therefore, largely dependent upon the magnitude of the enterprise relating to these hydrographic districts.

At least seventy-five per cent of the forest floors of California are incline planes, and of these planes, at least sixty per cent have a declivity of twenty degrees. This is conveniently illustrated by cut No. 1, which is from a photograph of a heavy forested declivity illustrating the growth of trees on steep inclines of river canyons.

Cut No. 2 is an illustration of a forested canyon, showing the large tree growth at the foot of a declivity in the very trough of the canyon, with the wooded hills in the distance.

PLATE NO. 6—GROUP OF LARGE WHITE PINES BETWEEN OPEN GLADES.

The space allotted to this article in this publication will not admit of any extended discussion as to the effects of forests upon the climate of California or the influence denudation would have upon the meteorological conditions of the State; but it will be accepted as a pardonable digression from the plan of this article to call attention to the very obvious fact that since seventy-five per cent of the forest areas of California are found upon inclines of from fifteen to thirty degrees, the absence of the forests will cause the soil upon these slopes to disappear. The heavy rainfall of the region will erode these declivities and very soon lay the underlying bedrock bare. The soil floor of the forest having disappeared, its reservoir capacity will be extinguished and the immediate delivery

of the precipitation into the channels of the central drainage of these areas will vastly augment the torrential character of the streams and ultimately destroy the navigability of the principal water highways of the State. Greatly increased maximum flood stages during the rainy season would ensue and unnavigable low water in the river channels for a period of six months in each year would follow.

Cut No. 3 illustrates a densely forested area covering a mountain plateau. The forests shown in the illustration will produce fifty or sixty thousand feet of merchantable lumber to the acre.

Rising above six thousand feet, there is a finely forested region, graphically illustrated by cut No. 4.

Beyond this and upward toward the snowy summits of the great range, treeless fields are encountered having a picket line of stunted fir and spruce. This is the frontier of vegetation; the blending zone between the prevailing summer of the lower altitudes and the perpetual winter of the extreme summits. Cut No. 5 is an adequate illustration of this interesting region.

The mountain plateaus may be divided into two classes—the level and the even. The designation "level" may be accepted for what that term means; the "even" designates an undulating floor with gradual and easily accessible slopes. These mountain plateaus are frequently interspersed with open glades, treeless because of excessive moisture. Cut No. 6 illustrates a group of large white pines between these open glades. The trees in the original, within the field of the camera, have an average diameter of five feet and an average height of two hundred feet.

The attention of the reader is respectfully called to the classified exhibit of California in the Forestry Division.

THE LUMBER INDUSTRY OF CALIFORNIA.

By E. J. HOLT.

Those who have gathered statistics (T. B. Walker of Minnesota, and others) upon the timber supply of the United States agree upon the following (not reassuring) facts:

In the whole country they find about 1,003,000,000,000 feet (board measure—one inch thick and twelve inches square) of visible supply now standing. Of this total about 625,000,000,000 feet (over 61 per cent) is in the three Pacific Slope states, viz, Washington, Oregon and California. Of these three, Oregon has 225,000,000,000 feet (36 per cent), California and Washington each 200,000,000,000 feet (32 per cent).

The census of 1900 shows that the timber cut of that year was 26,000,000,000 feet, or .026 of the visible standing. Beyond this the supply was further depleted by some 3,000,000,000 feet cut into shingles, railroad ties, piles and other similar round, hewn and split products, and the process of elimination is increasing in an alarming degree. At this rate, were it possible to fit the product to the needs of the market, thirty-five years would see the end of our United States supply.

However, there is a saving clause so far as the California forests are concerned, inasmuch as the greater supply and greater demand is for "common" grades for rough and framing work, for which, when the time comes, steel will be more largely substituted; while California's high-grade finishing woods will supply the needs for a longer period by far than thirty-five years.

California's asset in her timbered lands is, therefore, becoming appreciated not only because of its present value, but more particularly as it is the last and at the same time to be the most valuable forest on earth.

This pertinent fact demonstrates that as the timber tracts of the United States east of the Rocky mountains are rapidly becoming exhausted, especially so far as refers to woods in quantity and of quality with which to supply the domestic trade with material for interior and exterior finishing, shop work, doors and sash, etc., in fact, for all other purposes than common framing, the market must soon be largely supplied from this coast, and that California will, as time goes on, be called upon more and more for its wood for these and many other purposes.

The particular uses mentioned require "clear" or "select" qualities of wood susceptible of easy working, slight shrinking and swelling, and which will take and hold good a finished surface, and of all Pacific Coast woods, the redwood, sugar pine and white pine of California are pre-eminently adapted to fulfill these requirements.

A VIRGIN REDWOOD FOREST.

California woods also offer a source of supply sufficient for the probable needs of the next three generations, inasmuch as redwood trees produce from 40 to 75 per cent of "clear" and sugar pine and white pine from 20 to 30 per cent, as against the 3 to 5 per cent of the woods of the Middle West.

California produces a variety of commercial woods, the most used being redwood, white pine, sugar pine, fir, spruce, cedar, "bull" pine, cottonwood, laurel, and eucalyptus, and in proportionate quantities about in the order named, redwood being produced in the largest quantity of any, while the four last named cut but little commercial figure.

Redwood

(Sequoia sempervirens) is indigenous to this State; it covers a tract on the northwestern coast of California beginning at the northern line (there being not over 2,000 acres over the line in Oregon), and occupies a continuous and fog-fed district from the seacoast eastward to the crest of the Coast Range of mountains about 240 miles long (north and south) and from 10 to 20 miles wide.

In this district were originally about 1,200,000 acres of redwood timbered lands, comprising practically the world's total supply of this most magnificent wood, having from sixty to seventy billion feet of superb merchantable timber, besides from 10 to 20 per cent more in volume of by-products—split ties and posts, wood, some fir and tan bark.

Some thirty mill plants have since 1860 grown up and grown rich in this district, and they now own a little less than one-half of the timbered acreage. These mills have removed probably not more than 15 per cent of the original standing, having during the forty-three years averaged 200,000,000 feet per annum, while the cut of 1903 from this district (comprising the counties of Del Norte, Humboldt, Mendocino and Sonoma) was slightly over 300,000,000 feet. The present mill capacity is about 450,000,000 feet, based on the theoretical ability to run continuously, which, however, is an overestimate of practicable results.

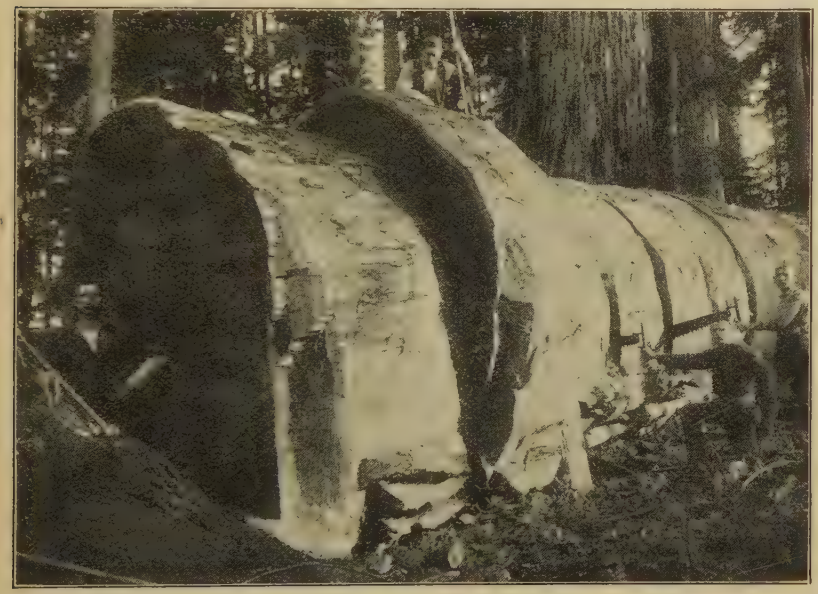
The further existing supply of this wood is found only in the three small counties lying next south of San Francisco along the coast. This supply is very limited, the acreage being small and the timber of low grade, while the present rate of production, even though not now supplying the full demand of these counties, will have exhausted the total supply within the next decade.

In the middle eastern part of the State stand in scattered groves the total remaining samples of the *Sequoia gigantea,* the monarchs of the world's forests. They too are redwood *(Sequoia),* but of a very different character, the product being brittle and soft and therefore not only difficult to handle but also mars so easily as to place it at a disadvantage in the markets where it meets the *sempervirens.* The nearby rail markets will consume the product at good paying prices.

A wise government should, however, buy and reserve this melancholy remnant of the most wonderful tree product of the world,

not alone for the sentimental value, but also for the very practical and absolutely essential purpose of conserving the supply of water for the irrigation of the enormous and wonderfully fertile San Joaquin valley, which with water could support a population of five million souls.

Besides these standing sequoias there are no others on earth except a few stunted trees in Japan. A curious fact and food for speculation is the presence of fossil remains of sequoia in Nevada, indicating, as do other facts, that we are witnessing the dying gasps of the last few hoary giants of an expiring species, probably the grandest flora of creation. Scientific research proves the age of many of these trees to be nine hundred or more years, while



SAWING THE REDWOOD LOGS.

it is an accepted probability that some of them were glorifying their Creator long before the beginning of the Christian era.

From the foregoing it will be clear that the redwood of commerce, from the broader standpoint, will all come from the district on the northwest coast of California.

The topography of this district is generally that of a slope westerly from the crest of the Coast Range of mountains, which slope is serrated by lateral ridges separated by streams and rivers fed annually by from 50 to 80 inches of rain. The water shipping point in Del Norte county is an open roadstead; while for the whole of Humboldt county, the great bay of the same name affords a number of landings.

Mendocino county has a rock-bound coast without bays or har-

bors, and cargoes are loaded over suspended wire chutes or trolleys, the outer end of the trolley wires being anchored in the ocean. The wire crosses the deck of the moored steamer, the slack being taken up to ship's gaff, thus making a tight wire, up and down which a traveling car is sent.

Del Norte and Humboldt have no railroad connections with the markets, and but a very small part of the output of the other counties is now so handled, 95 per cent of the total being handled by water.

Logging is mainly done by steam, fixed engines (bull donkeys), operating as much as one and a half miles of steel wire, dragging a train of logs containing from 30,000 to 50,000 feet to either a river bank or more often to a logging railroad, which in turn delivers the logs to the mill. Logs are cut in lengths of from 12 to 20 feet and from 16 inches diameter up to capacity of mill.

Sawing is done mainly with heavy band-saw mills, which have lately displaced most of the old double and triple circulars.

Machinery is necessarily very heavy, as butt logs frequently sink, while the average weight of fresh-sawn lumber is nearly four pounds per board foot. Commercial trees have diameters at the stump ranging from 20 inches to 17 feet, and averaging about four feet in the northern part of the district, and one foot less in the southern part.

Mill companies generally own their lands, at costs varying from 60 cents to $1.50 per thousand feet on the stump. A mill buying stumpage for immediate cutting would be called upon to pay from $1.35 to $2.50 per thousand feet on the stump, according to availability, amount per acre, quality, etc. Humboldt and Del Norte timbered lands carry from 50,000 to 150,000 feet per acre, averaging about 75,000 feet, while Mendocino county lands carry from 35,000 to 100,000 feet per acre, averaging from 50,000 to 60,000 feet. Quality of product is softest in the northern part of the district, more acid appearing with consequent increasing hardness and weight the farther south the growth.

Markets for redwood are world wide. Its fitness for a great variety of uses is extraordinary. Its fire-resisting qualities are unique, owing to presence of acid and absence of pitch or resin. When green it is difficult to burn it at all, and when dry it is not easy to ignite and is easily extinguished. The Fire Marshal of San Francisco is on record in writing, authorizing its use in the building of "fire walls" above brick buildings. When the Baldwin Hotel (six stories of brick and wood) burned in San Francisco some years ago, two redwood water tanks on top of the only standing brick wall were found to be intact, being hardly charred, and were still water-tight. It endures the action of both weather and soil to a remarkable degree, the writer having in his office a shingle in good condition which was taken from a roof in Fort Humboldt after forty-one years of service. Experience proves its efficient life under ground to be twelve years, as against fir, four years, and oak, six years. Its acid also makes it distasteful to insect

pests, and effectually prevents their ravages, which are so disastrous to most other woods. Marine pests will attack it ultimately, but only to a limited degree and after a long time. Costs of product delivered in San Francisco average about $13 per thousand feet, while the present selling price averages approximately $18 per thousand feet.

Quoting two authorities: "Such, then, are some of the qualities and many of the uses to which redwood is pre-eminently adapted; and when its virtues have been properly tested, it has never yet been supplanted by any other wood in the lines for which its peculiar virtues recommend it. The constant increasing demand in countries where introduced speaks volumes in its

A DOOMED FOREST GIANT.

praise. It is certainly very difficult to find any constructive wood in the whole realm of building material that for beauty and grandeur of growth, variety of grain, structure or color, or the purposes for which it can be used, will surpass the *Sequoia sempervirens.*"

"It is a beautiful lumber, wide and clear. It has a quality as distinct as the territory in which it grows. While not a veritable salamander, it is closely related to the salamander tribe. The district bounded by the fire limits of San Francisco is smaller than that of any other city of its size in the country; one reason being that the buildings are constructed largely of redwood and will not easily burn. * * * The fact that redwood swells, shrinks or warps but slightly especially adapts it not only for shingles but for

tanks, vats and patterns, while its rich color and susceptibility to high polish, especially of the curly grained varieties and high birds-eye burls, are bringing it into great demand for cabinet work. * * * The stumps of trees felled half a century ago are mostly as sound today as they ever were. Rarely does a redwood stump show signs of decay. * * * Will redwood hold paint? Here again is culled out one of the many good qualities of this matchless wood. Redwood will hold paint better than any other building wood, a fact that is demonstrated beyond a doubt wherever it is in use; and this, together with its non-warping and non-shrinking qualities, make it peculiarly adapted for siding and outside finishing of buildings."

In 1897 a book called the "Home of the Redwood" was published, setting forth by word and picture the wonders and details of the redwood industry. Unfortunately but few copies remain unsold, as Eastern lumbermen have of later years been busily showing their faith by their acts of investigation and investment.

Pine.

Sugar pine *(Pinus lambertiana)* and White pine *(Pinus ponderosa)* have their habitat in the high Sierra, near the snow line. These woods grow mixed and are friendly neighbors with the "bull" pine *(Pinus jeffreyi)* and a cedar, which latter two, however, are of scanty supply, coarse growth, and therefore used for rough work locally, not being qualified to meet other woods in common markets.

The lowest altitude in which these woods best thrive is about 3,000 feet, while the highest is about 7,000 feet, the best growth occurring at an elevation of from 4,000 to 4,500 feet. They are evergreen; their needles dropping as new ones grow throughout the year. They thrive best in the red mountain soil, which is a mixture of clay and bedrock, substrata of the mountains being slate and granite.

The average diameter of saw-timber is about 3 feet, though trees down to 14 inches in diameter are cut for sawlogs. The larger specimens attain a diameter of from 8 to 12 feet, with a height of from 180 to 250 feet. The average distance from ground to limbs is 60 feet, though frequently 90-foot bodies are found. These woods also grow mixed with redwood on the coast, but they are of hybrid quality and infrequent.

The natural habitat is like that of redwood, its northern extreme in southern Oregon, but extends southeasterly to the desert section of the southern part of the State, not far south of Yosemite valley. It also grows to some extent in Nevada and in Arizona; but in these latter districts the growth is sparse, the body short, and the quality of much lower grade than that of California. The best growth is in the tier of counties in the northern central part of the State having a westerly watershed, and is practically continuous southeasterly.

The Southern Pacific Railroad and its easterly branches at Sisson, Chico, Red Bluff, Sacramento, Stockton, and along the east side of the upper part of the San Joaquin valley, receive and

transport the total cut of these woods except such little as is used locally. In many cases private mill-owned roads connect mills with main railroad, and also in many cases box and door factories located at mills prepare the lower grades of the product for their ultimate uses, thus saving both cost in manufacture and in transportation. Logging is done partly by steam and partly with animals, as the logs average much smaller than redwood, but still much larger than the pine of the Middle West.

Costs of production vary, but probably average close to $12.50 per thousand feet on board main-line car, while the selling prices range from $10 for low-grade box material to $50 for No. 1.

The sugar and white pine interests are in a flourishing condi-

A BOARD SIXTEEN FEET WIDE.

tion, due to the efforts put forth in the past three years by the principal manufacturers in introducing this lumber throughout the entire Eastern States, between the Rocky mountains and the Atlantic seaboard, from Wisconsin to the Gulf of Mexico, and it has been demonstrated through the manufacturers of sash and doors and to the general user of white pine throughout this vast territory, that the California product holds equal merit with the old-time popular so-called cork pine of Michigan and the white pine of Michigan, Wisconsin and Minnesota.

These woods are white, soft, durable, straight-grained, easy to work, slow to absorb dampness, take polish or paint, will and can be milled in match sizes without splitting easily, though splitting clean if forced. They shrink less than most pines, which fact

is essential in good flooring timber, but these woods are too soft for this purpose, yet are unsurpassed for finish, ceiling, doors and sash, patterns, trays, sinks, kitchen tables, cabinets, shelving, etc. Where reasonable strength, durability, ease in working by either hand or machinery, cleanliness and stability of form and surface are wanted at a reasonable price, these woods have no peer.

The Diamond Match Company has lately acquired large holdings in the counties of Butte, Plumas and Tehama and has completed a 35-mile standard railroad to connect its tract with the main railroad at Chico. The company plans a total investment of over $3,000,000, a good part of which is already expended. The Scott & Van Arsdale Lumber Company has a similar plant in full operation in Shasta county, worth $3,000,000 or more. These plants are exceptions, however.

In conclusion, it seems fit that this article should make a plea for forest preservation, conservation and renewal. Under present laws and competition, the methods of lumbering are wasteful in the extreme, it being a probable fact that approximately only fifty per cent of the actual standing timber is marketed, while the logged-over tracts are burned and totally neglected, to the utter extinction of the forest tree in that locality. Reforestry is unthought of and the young trees are treated as a nuisance.

THE FISHES OF CALIFORNIA.

By DAVID STARR JORDAN,
President of Leland Stanford Junior University.

The total number of fishes known to exist in the waters of California is 435. These may be grouped in regard to their distribution, as follows: About 165 species may be referred to as cold-water fauna. These are species that live near the shore, and whose proper home is found north of Point Conception, or in the cold current which sweeps along our coast, and which renders its waters less warm than in corresponding regions on the Asiatic side. About 117 species belong to the semi-tropical fauna. This occurs to the south of Point Conception and beyond the reach of the cold currents of the north. Of course, these two categories are not sharply divided by Point Conception. Many of the northern species are found south of this point, in deeper water, or among the rocks, some even of the northern species going far down into Mexico. On the other hand, many southern species find their way northward as far as San Francisco.

Of the 165 species that belong to the north of Point Conception we have two very distinct categories; the one comprises the Arctic

and sub-Arctic fishes like the halibut, the sturgeon, and the herring, and several varieties of the flounders. With these are a great body of peculiarly California types, which are scarcely or not at all represented in other regions, and which evidently had their origin upon our coast. Among these, and most conspicuous, are the various species of surf fishes, all viviparous, all commonly and wrongly known as perch. Scarcely less abundant are the various species of rock fishes, red, green, and black in color, which go by the general name of rock cod. The presence of these two types, both viviparous, together with the peculiar coast type of salmon, is the most remarkable feature of the fish fauna of California.

The species which belong south of Point Conception are in most cases closely allied to tropical species, and have evidently had their origin in migrations from the south. These are, as a rule, not distinctly Californian, but belong to types which are widely diffused through the warm waters of the tropics. Their relations are with the West Indian forms, rather than with the other fishes of California.

About one hundred species of deep-sea fishes have been obtained by the "Albatross" in the depths of the ocean off the continental slope of California. These creatures are as a rule very soft in body and almost black in color, and many of them covered with luminous spots, or lanterns, by which they can see their way in the darkness. They live in the open sea, at a depth of from two to five miles, and their soft bodies at this depth are rendered firm by the tremendous pressure of the surrounding waters. In their native haunts the light and heat of the sun scarcely penetrate, the darkness is almost absolute, and the temperature of the water is at the point of freezing. The creatures living at these great depths are not, generally speaking, descended from the shore species of the same region. They constitute groups by themselves, and forms very similar are found in all parts of the ocean, from the poles to the equator.

About forty-five species inhabit the fresh waters of California. These are about equally divided between the great basin of the Sacramento and the San Joaquin and the basin of the Colorado. Besides the species of trout, most of the fresh-water fishes come under the head of suckers and chubs.

Fishes for the Table

Of the whole number of fishes found, 133 of the marine species are properly to be called food fishes, found more or less frequently in the markets, and being more or less fit for table use. The others, on account of small size, ill favor or tastelessness of flesh, are not used for food; or else are used only when salted and dried by the Chinese, to whose soups and chowders nothing seems to come amiss. About twenty of the fresh-water fishes are also food fishes, but only seven or eight of these have much value as such.

The distribution of fishes, that is, the question of the extent of the area inhabited by any particular kind, depends on a number of different conditions, the most important of these being the

temperature of the water. Most fishes are extremely sensitive to any change of heat or cold. Where, as is sometimes the case, the temperature of the water changes abruptly at a given point, the character of the fishes will be found to change equally. A very little cold is often sufficient to benumb and paralyze a fish of the tropics. On the other hand, the fishes of cold regions can not endure any degree of heat to which they are not accustomed; and doubtless the fishes in the depths would be suffocated by the temperature of the surface water, even if their lives were not destroyed by the diminution of pressure.

Another element almost equal in importance is that of depth. The great majority of marine fishes that we know well, or that we recognize as food fishes, are shore species, inhabiting depths of from one to fifteen fathoms. The great variety of oceanic life is found within this range, through which the light and heat of the sun readily penetrate. As we go lower we find that the shore fauna disappear. The greenish-colored shore fishes give place at from fifty to one hundred fathoms to other species, the prevailing color of which is red. The green or gray colors match the colors of the sand and kelp; the red ones harmonize with the red sea mosses among which the red fishes live. In still greater depths, where light and heat disappear, the prevailing hues are violet or black, the color of darkness.

Cannibals of the Sea.

Of less importance, but still a determining quality for very many fishes, is the character of the food to be obtained. Each species thrives best where those creatures on which it naturally feeds are most abundant. The herbivorous fishes live among the tide pools, where they can feed upon the small seaweed; the crab-eating fishes live among the rocks, and those which feed upon herring and silversides flourish best in the open sea.

As regards their preference in the matter of surroundings, the fish of the coast may again be divided as follows: Of the pelagic species, about twenty visit the coast of California. These are fishes which swim freely in the open sea, living mostly near the surface, often moving for hundreds of miles and belonging to no one country more than another. Of species living about the rocks and feeding upon the small animals which abound in the seaweeds there are fifty species, of which thirty belong to the group known as "rock cod." All of these are food fishes, although not of the best quality. One feature concerning them which is not generally known is that all of them are viviparous. Their eggs are laid in immense numbers, but they are hatched in the body of the female, so that the young are born at the length of one-fourth to one-sixth of an inch, and commonly rolled up in a coil, only the closest observers being able to detect that the egg was hatched before being turned loose in the sea.

Of the kelp fishes there are twenty-five species. These are chiefly confined to the beds of kelp which are characteristic of the California coast, nothing like it existing on the Atlantic. Some

of these feed upon seaweeds themselves, more upon the mollusks and crabs which find their home among the marine plants. Like the rock fishes, the kelp fishes are usually taken by the baited hook from the deck of a boat.

There are ten anadromous species; that is, species which ascend the river in the spring or fall for the purpose of spawning in fresh water, but passing the greater part of their lives in the sea. Of the anadromous fishes the most important are the salmon; the largest in size are the sturgeons. But besides these species several little ones, such as the lampreys, have similar habits.

The fisheries of the coast as a whole are relatively little developed. The bay of San Francisco, the bay of Monterey, the bay of San Diego, and a region about Avalon are fully fished—overfished at times; but the great length of the coast remains almost untouched. Captain Collins estimates that on the 2,000 miles of the coast of California, Oregon and Washington the fisheries are about equal to those of 500 miles on the coast of New England. The value of the product is about the same in the two districts, and may be roughly set down at $15,000,000 per year. Of this amount the salmon fisheries of the Columbia represent between a third and a fourth, and some $4,000,000 belongs to California. This represents from 30,000,000 to 40,000,000 pounds of fishes each year.

The salmon fisheries of the Sacramento are chiefly in the counties of Solano and Contra Costa. For a number of years these fisheries steadily declined. This was due to overfishing and to the destruction of the spawning beds through lumbering and placer mining. Practically, the only spawning beds left in the Sacramento basin are in the river itself about Red Bluff. The United States Fish Commission came to the rescue, and through the hatchery stations at Baird and Battle Creek it has repopulated the river. At present more salmon run in the Sacramento than when the stream flowed through primeval wilderness.

The salmon of the Sacramento is the quinnat or king salmon, the largest and finest of all the salmon tribe. It reaches in four years an average weight of sixteen pounds. When mature, at the age of three or four years, it leaves the sea and runs up the stream to spawn. It leaves the sea in early summer and spawns in the fall in the upper reaches of the rivers. After spawning all die, male and female. After leaving the sea the salmon of this species never feed, although they readily take the trolling hook in Monterey bay. The salmon has from 4,000 to 5,000 eggs. As naturally spawned, one egg in a hundred or more hatches and escapes its enemies. The fish hatchery undertakes to hatch ninety-five out of every one hundred and to put them in the river to drift downward to the sea—"tail foremost," in the old salmon fashion—to return again as mature fishes. The salmon are best as taken in or near the sea. From August to October the old ones are practically unfit for food, being lean and poor.

The Real Fish Royal.

Besides the trout and salmon, California has many other game fish. First of these is the great tunny, or leaping tuna, which ranges from 150 pounds to half a ton, and finds its greatest abundance about Avalon. This wonderful bay has many roving fishes, taken with the trolling spoon—the yellow tail, the albacore, and the huge bass called jewfish, with a head as large as a bushel basket. The barracuda and the great flying-fish are among the game fishes about the Santa Barbara islands.

These noble fishes deserve protection from the amateur angler who catches a dozen or a hundred, has them hung up and photographed, himself beside them, then hires the guide to bury them while he goes away to have fun in his own fashion somewhere else.

Of introduced fishes, two, the striped bass and the shad, both planted about 1878 from the Potomac and the Schuylkill, have been of the greatest value to California. The striped bass can be found in the markets at all times, and in flavor they are as good as in their native waters.

Other fishes which have been introduced are the carp, which has proved an unmitigated nuisance; the two species of catfish, which while having value, have displaced better native fishes and should have been left at home; the black bass, which thrives well in the ponds; and the green-blue sunfish, introduced into Clear lake as food for the bass. The most valuable fish yet to be introduced is the Japanese ayu, or samlet, a diminutive salmon about a foot long, as delicate in flesh as a fish can be. It runs in countless numbers in all the clear streams of Japan, Corea, and Formosa, and should have a place in California. The eel should also be introduced into California.

I may note in passing that the markets of San Francisco fall far short of what they ought to be, and many fish are served in a stale condition. Even our best hotels are none too particular, for which reason our Eastern visitors often wrongly infer that our fish are not so good as those to which they are accustomed. The fish are just as good, but in our glorious climate they keep longer without decaying. But in doing this they grow very stale and lose their fine flavor. The difference is not in the fish, but in the care the dealers take of them, and as to this San Francisco will some time grow more exacting.

We Get Alaska's Best.

The fisheries of Alaska are also largely tributary to California, being developed by California capital and the product mostly brought to San Francisco. The red salmon, blueback salmon, or sockeye, in Alaska outranks in value every other species of fish in the world. Its annual product in Alaska is worth $1,000,000 more than the original cost of Alaska to the United States. It exceeds the entire mineral output of Alaska per year by $1,750,000. The pack of red salmon and other salmon for 1902 amounted to 2,631,320 cases (forty-eight pounds), worth on an average about $3.50 each, or $9,207,520 in all. That of last year (1903) is somewhat

smaller, but is valued at between $6,000,000 and $8,000,000. The greatest red salmon fisheries are about Bristol bay and Kadiak island, but the species runs in some thirty different streams from Puget sound northward to the Yukon.

The codfish is as abundant in the North Pacific as in the North Atlantic, but the limitations of the market have prevented their development, except about the Shumagin islands and in the sea of Okhotsk. The herring and halibut have also a large and growing importance in Alaska.

Our Chief Food Fishes.

The following is a list of the chief food fishes of California, arranged in systematic order, beginning with those of simplest anatomical structure. They are grouped in classes. A—those of high importance; B, C, D—progressively less:

Soup-fin shark (D), used by Chinese; California ray (D), used by Latin people.

White sturgeon (B), green sturgeon (D).

Quinnat salmon (A), silver salmon (C).

Steelhead trout (A), Tahoe trout (A).

Rainbow trout (A), cut-throat trout (D).

Dolly Varden trout (D), eulachon (C).

Surf smelt (B), small smelt (C).

Shad (introduced, A).

Herring (A).

Sardine (A), anchovy (C), silver anchovy (D), moray (D).

Sucker (D), squaw fish (D).

Chub (D), carp (introduced, D).

Bullhead (introduced, B), gray catfish (introduced, D).

Needle-fish (D), flying-fish (C).

Pesce rey (blue smelt, A); small pesce rey, miscalled smelt or white bait (C).

Mullet (B), barracuda (A).

Sand lance (D), chub mackerel (C).

Santa Cruz mackerel (D), tuna (A).

Albacore (A), oceanic bomto (D).

California bomto (B), alleterato (D).

Sword fish (C), yellow tail (A).

Horse mackerel (C); poppy fish, miscalled pompano (B).

Mariposa (D), Sacramento perch (C).

Striped bass (introduced, A), jewfish (B), San Diego rock bass (C), banded ronco (D).

Spot-fin cracker (C), queenfish (B).

Kingfish (C), sea bass (A).

Weakfish (D); California surf fishes or perch, twenty kinds (C, D).

Garibaldi (D), fathead (B).

Senorita (D), headfish (D).

Rock fish, thirty species, called rock cod (A).

Priestfish, Spanish flag, Boccacio, etc., red, black, green, banded or speckled (A, B).

Skilfish (C), greenling (C).
Blue-spotted greenling, sea trout (B); cultus cod (C).
Blanquillo (C), kelp fish (D).
Pollack (D), tomcod (B).
Hake (C), halibut (A).
Monterey halibut (B); flounders, thirty kinds (B, C).

CATTLE-RAISING IN CALIFORNIA.

By PETER J. SHIELDS.

The breeding of livestock in California has many features peculiar to itself, and may well be said to be in a formative condition. The breeding and ranging of cattle of both the beef and the dairy varieties are in a condition of adjustment, and the next ten years will witness many material changes in the manner in which they are conducted.

California is probably the only one of the Middle Western and Pacific Coast states which does not produce all the dairy and beef cattle used and consumed within its borders, and at the same time ship cattle for slaughter. This condition is the more remarkable when taken in connection with another fact, which is that California is the best fitted by reason of soil, climate and food products to produce cattle economically of any state in the Union. The reasons for this underproduction are many. California is not an old state, nor is its population dense. Its agriculture is not greatly diversified, and there is almost an entire absence of the small breeder and of small herds bred and fed upon the farm. The chief reason, however, is that California's energies have been exercised in other directions, and she has subordinated her beef-growing and dairy industries to others which she has carried to a high development. Her first great industry was mining, and she produced more gold than any other state in the Union, or other subdivision of the earth. Wheat-growing followed, in which she took high rank, especially excelling in the use of agricultural machinery. Horticulture succeeded, and in this particular she is without a parallel. Cattle-breeding has waited on these industries; but in the progress of events the day of the cow has come, and the next few years will witness a development and perfection in the breeding of high-class cattle which will compare with her present horticultural pre-eminence.

At the time of the acquisition of the territory of California by the United States in 1848 large herds of cattle of the Mexican type roamed over her foothills and valleys in almost a wild state. They were slaughtered chiefly for their hides and tallow, which

were purchased by traders plying vessels along the coast. Following the American occupation these conditions did not rapidly change, and some features of them still remain. The cattle-breeding industry of California is still distinguished by the large holdings of land, the vast herds and the great ranges. The ranges of such breeders as Miller & Lux and the Kern County Land Company easily exceed one million acres each, while ranges of nearly equal extent are owned and used by Cox & Clark, Vail & Gates, J. V. Vickers, The California Agricultural and Pastoral Company, the Howard Estate and many others. California, however, is not exclusively a range state. A very large number of cattle are bred and fed on irrigated alfalfa ranges in the central and southern

HOLSTEIN CALVES.

San Joaquin valley. Many cattle, too, are grown on the alfalfa fields in the Sacramento valley, where, on the moist rich lands along the rivers and on the irrigated tracts, alfalfa grows to perfection; and wherever this incomparable crop is grown animal life takes on its highest development.

The number of cattle in the State is difficult to determine, the census returns from California being probably less reliable than those from other states where the holdings are smaller and the herds much more numerous. A study of the returns shows that the number of cattle is only slightly increasing under the range system. And it is not probable that it will increase. We must look for increase only as the result of the spread of irrigation, the growing of more alfalfa, the subdivision of large holdings, and

the advent of the farmer breeder and feeder. In 1860 California ranked sixth among the states as a cattle producer, reporting 1,180,142 head. In 1870, she fell to eleventh place, reporting less than two-thirds as many cattle as ten years previously. She showed little increase in 1880, by which time she had fallen to the rank of twenty-first among the states. In 1890 she reached her highest mark, when she ranked thirteenth with 1,367,118 head. By the census of 1900 she had fallen to seventeenth place, and the number of cattle had declined to 1,115,194 head. While these enumerations are probably under the correct figures, they clearly show that California has been developing her other industries at the expense of cattle-breeding, and that it was chiefly from progress in other lines that she has obtained her high rank among the states as a producer of wealth. In the United States there are 17.64 head of cattle per square mile, while in California there are but 7.15 head, she ranking fortieth among the states and territories.

To determine what percentage of the cattle used and consumed in California are bred and grown in the State is difficult. The best advices at the writer's command lead to the conclusion that not more than forty-five per cent of the cattle slaughtered in California are home-bred and grown.

There are slaughtered in San Francisco each month about 15,000 cattle, at Los Angeles about 9,000, at Sacramento about 1,000, at Stockton and Fresno about 800 each, and at other places in the State such an additional number as brings the monthly average up to about 50,000 head. To supply this demand there are annually brought into the State from the Republic of Mexico, Texas, New Mexico, Arizona, Oregon and Nevada about 350,000 head. Of this number about 150,000 come from Oregon and Nevada, about 150,000 from New Mexico and Arizona, and the remaining 50,000 from Texas and Mexico.

The grade of the cattle slaughtered in California is not at present as high as that of those which supply the great cattle markets of the Middle Western States. They are very largely range cattle and occasionally show in addition to the ordinary range characteristics some slight traces of their Mexican ancestry. Considering their breeding, however, California cattle are unequaled, as the favorable climatic conditions under which they grow produce an excellence unapproached by animals no better bred. The use of pure-bred bulls upon the range is largely increasing, and range cattle are showing a marked improvement in size and quality. When they have been graded up to the breed standard of Eastern cattle, they will be of greatly superior individuality and merit, owing to the richness of the California grasses, and the climatic conditions being so favorable to growth and development. The cattle brought into California from Arizona, New Mexico, Texas and Mexico are most frequently Hereford grades and show more or less the characteristics of that breed. The Oregon and Nevada cattle have been generally Shorthorn grades of good type, but in

recent years the cattle from these states show a strong infusion of Hereford blood. Of the home-grown cattle of California about two-thirds are produced south of San Joaquin county and about one-third north of that place. These cattle are chiefly of the Shorthorn type, being grades of that breed upon the native cattle.

The first improvement of our cattle, however, was through the use of "American" cattle brought across the plains in pioneer days. These animals were undoubtedly mostly grades of some of the improved breeds. The cattle of the northern part of the State are of marked superiority over those farther south, owing to the much larger number of pure-bred sires having been used by the northern breeders. This larger use is attributed to the annual

CATTLE IN CLOVER.

exhibitions of fine cattle at the state fairs at Sacramento, surrounding which city the superiority is most marked.

Dairy Cattle.

In cattle classed in the census as "milch cows" California ranks somewhat better than as a producer of beef animals. While she occupies the same rank, being seventeenth in each, she compares more favorably with the states ahead of her. The last census credits California with 307,245 milch cows, being about one-fifth as many as New York and Iowa and one-third as many as Illinois, Pennsylvania and Ohio. Dairy statistics of California will be given elsewhere; it will be sufficient here to say that the quality of the dairy cattle of this State is not as high as that of other states which have specialized along dairy lines, and that until recent years the breeding

of dairy cattle has experienced the neglect incident to our more general attention to other industries. As to breed, the native or common cow predominates among our dairy cattle, although a very large percentage of them give indications of more or less improved blood, Shorthorn predominating. Jersey blood is very generally evidenced, with Holstein showing an increasing popularity.

Pure-Bred Cattle.

While the general average of California's beef and dairy cattle is not high, the contrary is true of the pure-bred cattle within her borders. The great fortunes which our pioneer citizens accumulated in the mines, in railroad construction, fruit- and wheat-growing, enabled them to indulge their taste for fine-bred animals, and early in our history and constantly since some of the choicest animals which money could buy have been purchased for California. Many famous herds have been collected, and from their increase, and as a consequence of their dismemberment and sale, many smaller herds are now scattered throughout the State, representing the best types of the various breeds. These herds have been well maintained, others are constantly being established, and California may safely be said to be on the verge of a great cattle-breeding development.

Shorthorns.

Shorthorns were first of all the varieties of pure-bred cattle to be introduced into California, and have always remained favorites with our beef-breeders and dairymen. Among both our beef and dairy cattle the Shorthorn cross is most frequently encountered, and to it we are probably most indebted for what progress we have made in improving our cattle. The first known introduction of pure-bred Shorthorns into the State occurred in 1858, although well-bred animals had previously been brought in by immigrant trains across the plains. After this, importations were steady and frequent, until now the blood of this royal breed is well distributed and in the hands of aggressive and intelligent breeders. At the present time twelve or fifteen large-sized breeding herds exist in the State, representing all of the most prominent families, domestic and imported, including a number of herds of high-class milking Shorthorns. In addition to these, many smaller herds exist, and still more herds of very high-grade females headed by choice pure-bred sires. A splendid field exists in California for the establishment of choice herds of this popular breed, where a ready sale for surplus animals at good prices is assured.

Herefords.

Of recent years, the Hereford, now so popular as feeders both in the corn-growing states and upon the western ranges, has been making many friends in California. Up to 1884 this breed was known only to our people through individual specimens, but during that year a large herd was brought to California from New Zealand, shown at the state fair at Sacramento, and sold throughout the State. Since that time these cattle have enjoyed an increasing popularity until within the last few years they have been taken up by many strong

breeders and may now be considered as well established here. Six or eight large and very superior herds of the choicest Herefords are now owned in California and the breed is daily obtaining a wider popularity. A strong demand exists for cattle of this breed, and a much greater number could be bred here at a good profit.

Devons. This highly meritorious breed is singularly fitted for a considerable use under the conditions which prevail in California, but is unaccountably neglected. The first Devons were brought here in 1860, and since that time have been bred and used by a number of active breeders. Some use is now made of Devon bulls, but few animals of the breed are available and our breeders have generally ceased to look for or use them. But one or two pure-bred herds are owned in the State, and they are little advertised and never exhibited. An active breeder of this useful breed, having good animals, could undoubtedly find a ready sale for his surplus at good prices.

Polled Angus and Galloways. It will occur to the breeders and feeders of the great Middle Western cattle belt as strange that these great breeds are little used in California, but such is the fact. For some reason our range breeders have not regarded them as successful when ranged with large herds of the type of cattle used in California under the conditions which prevail here. In small herds, as feeders and in the hands of the farmer breeder, they have been most successful, but as such herds have not been numerously maintained heretofore in California, these animals have not been sought for. Under the changed conditions now dawning in the State they will be in demand and the time is now ripe for the establishment here of good herds of these famous breeds.

Red Polls and Brown Swiss. A few Red Polls have been brought to California and have met with popular favor. Wherever they have been used, either in the dairy or on the range, they have given satisfaction; but their use has been so recent and so limited that they have made no impression on the type of California cattle. Even less can be said of the Brown Swiss, of which the writer knows of only one herd in the State.

Guernseys. This great breed has been strangely neglected in California. In 1881 the first herd was brought to this State direct from the island, but it was not long maintained. Its dispersal, however, carried its blood into many of the practical dairies of the State, and did its part to enrich them. Individual animals have from time to time been brought here, and at the present time a number of choice animals of this breed are being used and bred from in the larger dairy region about Fresno. They are meeting with such favor that the demand for Guernseys is now great, and a breeder of these popular animals could find no better place to conduct his business than in California.

Jerseys. This great breed has long been popular in California and is the most generally distributed of any of the improved dairy breeds. Fortunately for the Jerseys, they early attracted the attention of a number of California's wealthy men, who spared neither money nor pains to secure the best possible representatives of the breed. The first Jerseys in any number were brought here in 1872, and for some years following they were brought very numerously into the State, shown at the annual fairs, and distributed generally over the State. Most of our dairy herds show some trace of Jersey blood, while we have a large number composed of very high-grade animals headed by registered Jersey sires. In California the Jersey has prospered exceptionally, the mild climate and rich grasses of the State approximating closely to those of the island home of the breed. The breed is in good hands in California, and it is destined to reach a high development here. Two Jersey societies are organized, and the breed is represented by a very large number of small but choice herds. But few large breeding herds exist in the hands of aggressive promoters, but the wide distribution of the breed and their adaptability to California conditions insure their maintaining their position.

Holsteins. In Holstein cattle California is most prominent. Several of our most wealthy men early made favorites of this great dairy breed, and their keen though friendly rivalry gave a great stimulus to heavy importation. A few Holsteins were shown here in 1874, but not until about 1883 were they generally introduced. About that time many large herds were established here, most of which have since been disbursed and widely distributed. This breed is now liberally used in all parts of the State and is giving general satisfaction. They are used with particular success where alfalfa grows in abundance and upon the rich bottom lands, resembling those of Holland, lying along California's great river system. Several small herds of this great breed now exist here, while three large herds have been collected and established, of a character which will compare favorably with the best herds of this breed in the Eastern States. One of these herds particularly is said to be easily the best in the United States, and to contain more choice animals and high testing cows than any in this country. With the general introduction of irrigation and increase in population this breed will achieve a still wider popularity.

Future Conditions. A considerable change is destined to soon take place in the cattle conditions of California. Her mining, grain-growing and fruit-producing industries have been largely developed, and she is now turning her attention to livestock-raising and mixed farming. Irrigation is being much more extensively resorted to, and alfalfa much more generally grown. This plant grows in California more perfectly probably than anywhere else in the United States. By reason of this incomparable crop, and because the climatic and other physi-

cal conditions here are unequaled, we can raise cattle as nowhere else, and our people are beginning to so realize. Our large holdings are being broken up into homesteads, our population is rapidly increasing, and the day of the small farmer and farm-breeder is near at hand. When the grade of our cattle is raised by the use of pure-bred sires; when attention is given to care, selection and breeding, we will grow cattle in California which will give us a distinction as unique as that which we have heretofore enjoyed by reason of our products of fruit and gold. Cattle so grown will constitute an outcross for Eastern herds. The climatic and physical conditions are so different here, and with care and attention the type of our animals will be so perfect and their constitutions so sound, that the Eastern breeder, when seeking blood with which to strengthen and improve his herd, will look across the continent to California, instead of as now, across the ocean to the mother countries.

DAIRY INDUSTRY OF CALIFORNIA.

By ARTHUR R. BRIGGS,
General Manager of the California State Board of Trade.

The dairy industry of California is of all the first to give returns to new settlers, and is therefore entitled to first consideration by homeseekers. The impression prevails that there is much to learn in farming in California before one can hope to secure a comfortable living and enjoy the benefits which have been represented to him as an inducement to come to this State; but with the opportunity for making a good living at the outset, such as is presented in dairy farming, the newcomer has time to make himself familiar with the new conditions, and enjoy a fair return for his labor while he is studying the methods of fruit-growing and other branches of farming.

The State Board of Trade has occasion to answer almost daily, "How can a living be made the first year?" and, "What investment is required for one to establish himself on a profitable basis in a new home?" The first question is already answered. The second can only be answered in a general way; but the following estimate of cost should enable the average man to reach a fairly correct conclusion of what is necessary:

Forty acres of land, with water rights	$2,000
Buildings—house, barn, sheds, fences, etc	850
Domestic animals—horses, etc	400
Ten acres seeded to alfalfa the first year	100
Trees and shrubs about house, and for family orchard, etc	25
Farming utensils and implements	75
Total	$3,450

In the purchase of land it is not necessary to make the full payment the first year. One-third payment, or say $650 to $700, is generally the rule, and the balance can be carried one, two or three years, in equal amounts, so that the actual cash outlay at first need not exceed the sum of $2,000 or $2,500. With this capital the intelligent, industrious and economical farmer may safely establish a new home on forty acres of irrigated land in California.

The dairy interest in California is both interesting and important—interesting by reason of its possibilities, and important from its present magnitude. Dairy farming in this State may be classified into the following principal districts: The Humboldt district, which comprises Humboldt and Del Norte counties; the coast district, which comprises the coast counties, from Mendocino on the north to Santa Barbara on the south; the Sacramento Valley district, which comprises the country north of Stockton to Shasta county; the mountain district, which comprises Lassen, Sierra, Plumas and Siskiyou counties; the San Joaquin Valley district, which comprises the territory from Stockton on the north to the Tehachapi range on the south; and the Southern California district, which includes all that part of the State south of the Tehachapi range.

Conditions differ widely in these districts, and yet generally the quality of the butter produced is fairly maintained at the average high standard for which this State is famed. According to the last biennial report of the State Dairy Bureau the quantity of butter produced in 1902 was 31,528,762 pounds, representing a value of $7,541,729, of which 21,593,021 pounds were from creameries and 9,935,741 pounds from individual dairies; against 28,678,439 pounds in 1897, of which 10,866,646 pounds were from creameries and 17,811,793 pounds from individual dairies.

This illustrates the growth of the industry and the tendency of dairymen to operate through creameries, rather than attempt to compete with these institutions with butter made on the farm, which is not as uniform in quality nor as high in grade as the creamery product.

One of the principal features of difference in the districts mentioned is the character of feed. In the Humboldt district the industry is about stationary, and the available range for cows is pretty well occupied. In this district there are about forty small creameries, and most of the butter in the district is manufactured by them. On the coast there are but few creameries. This district is not holding its own in butter-production, owing, for one thing, to the demand of San Francisco for milk, which is supplied from this source. The Sacramento Valley district is on the increase. Woodland, the vicinity of the Sacramento, and the reclaimed lands of the Sacramento river, are among the principal producing points in the State. The mountain district, though less important in point of quantity, holds its own. The San Joaquin Valley district exhibits rapid growth, the estimated gain being 30 to 33 per cent in 1903 as compared with 1902. Here is

a wide area in alfalfa, and this is increasing largely from year to year. Dairy herds and dairy farming increase in like ratio. The southern district depends on cultivated crops and alfalfa for feed.

The industry, as a whole, is well established on a profitable basis throughout the State, although it has not yet reached the limit of coast consumption. Taken as a whole, the industry now represents a value of upward of $18,000,000 annually. The State Board of Trade predicts that it will develop rapidly in the future until California will be shipping extensively toward Eastern

A DAIRY HERD.

markets, instead of standing in the list of dairy states as an importer.

At certain times of the year, when local conditions favor it, large quantities of Eastern-made butter are shipped to the San Francisco market. This butter does not come up to the standard in quality of the California product, and is usually sold at prices slightly below the market for State product. Prices of butter in San Francisco are uniformly maintained on a higher basis than is obtainable for creamery butter in the Middle West.

The tendency in butter-making is more and more to creameries, but there is a disposition to decrease rather than increase the number of these factories. Experience seems to demonstrate the claims that large institutions can minimize the cost of butter-making, and that under good business management dairymen secure better results than by making butter on the farms or working through small creameries. Centralization of the industry in the respective

districts gives uniformity of quality, and to some extent prevents unprofitable competition in marketing the product.

The largest creameries in the State are in Fresno, Los Angeles, Stanislaus, San Joaquin and Sacramento counties, with capacity ranging from about 325,000 to 900,000 pounds annually. The output of these institutions is capable of large increase without enlarging present manufacturing capacity.

The quantity of cheese manufactured here for the year 1902, according to the report of the State Dairy Bureau, aggregated 6,503,441 pounds, representing a value of $702,371. The dairy industry of California is largely in the hands of men who have been bred to the business—Danes, Swedes, Italian-Swiss and Portuguese. Americans control about one-half the dairies of the State. The business is open to all, and there is no reason why any class should be more successful than any other with equal intelligence and experience. Near Sacramento, San Jose and Fresno the business is largely in the hands of Americans. The number of American farmers in this branch is rapidly increasing, particularly in the irrigated districts, and where the dairymen are owners of the land, not renters. Where the foreign element predominates they are generally renters.

Dairy herds in California are being constantly improved. Shorthorns, Jerseys and Holsteins are most in favor. Alfalfa, which a few years ago was not regarded as suited to the making of high-class butter, is now recognized as the ideal grass for dairy stock, and the peculiar advantage a dairyman has in an alfalfa district is in the greater number of cows that can be maintained. On alfalfa fields the quantity of milk per cow is greater than under other conditions. While ten cows and their increase can be maintained well on fifteen, at most twenty, acres of alfalfa the year around, ten acres of land are necessary to support a single cow where the native feed is used. On alfalfa feed cows well conditioned should give from 200 to 350 pounds of butter annually per head; but where only native feed is had the return per cow ranges from 125 to 150 pounds.

The matter of increase in calves is important. Dairies are renewed from the young stock. The dairyman has his hogs, which are fed and raised on the skim-milk. These sources bring considerable additional revenue. Cows properly cared for will yield a return of from $5 to $7 a month each, or from $60 to $85 annually.

The San Joaquin Ice Company at Fresno a few years ago secured a herd of high-bred cows, Holsteins and Jerseys, and inaugurated the policy of supplying them on lease contracts. Any farmer owning his farm, or who has made sufficient payment on a purchase of land, or invested enough in improvements to class him as a permanent settler, can, on application to the company, secure as many cows as he can properly care for, be it five or fifty. The purchase price is stated in the lease. The farmer has full possession and control, with the increase. He contracts to well care for the stock; to deliver all the cream or butter fat—

except what is necessary for home requirements—to the creamery, and to permit one-half the monthly returns to be applied as part payment on the contract. From actual experience it is shown that the majority of cows put out on lease are fully paid for in two years. The farmer has his monthly income, amounting to one-half the yield from the cows, all the increase and the hogs he has been able to support meantime.

With ordinary care cows are profitable for dairy purposes until they are from ten to twelve years old, and can then be fattened and sold for beef.

This industry affords wide opportunity for men of moderate as well as men of large means. The dairyman who delivers the product of five cows to the creamery stands on exactly the same footing as to price and other conditions as one who has fifty or one hundred cows. In this business there is no partiality or preference. The farmer has success in his own hands, and the measure of that success is his industry, economy and business capacity.

POULTRY-RAISING IN CALIFORNIA.

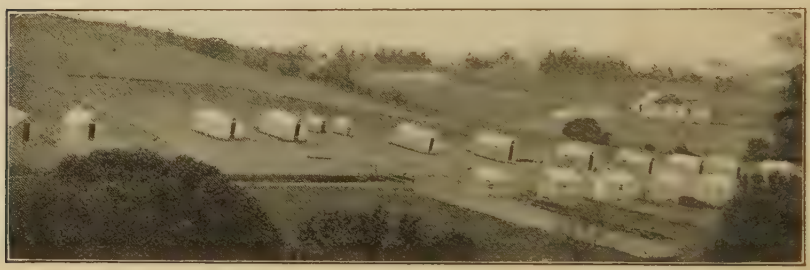
By L. C. BYCE,
President of the Petaluma Incubator Company.

In the early days of California following the gold excitement, a family which constituted part of an emigrant train that crossed the plains brought with them, in addition to horses and cattle, a few hens. The latter, while en route, were allowed their freedom in the evening, after the party had struck camp, and later on as the hens settled upon the wheels of the wagons or other suitable place to roost for the night, were carefully tucked away in their coops, only to have this repeated over and over again. Arriving at a California mining-camp every evidence of civilization, including the chickens, was welcomed. A good flock of hens at the time above referred to would have been equal to a gold mine, for the family owning these hens found ready sale for every egg at almost fabulous prices, as high as $6 in gold dust being paid for a single egg.

The luring sight of gold and its quest soon caused the chickens to be forgotten, and but few people interested themselves, and then only in a small way, until in the seventies. Previously no thought seemed to be given to the poultry business as a commercial proposition or as a means of livelihood, although late years have fully demonstrated that golden opportunities were lost. The writer, who was also engaged in perfecting a system of artificial incubation, imported from many of the Eastern poultry yards

large quantities of fowls, disposing of them in small numbers, which became widely scattered, and by encouraging those of limited or small means there has grown up a business of such magnitude as to be almost beyond the conception of the person hearing of it for the first time.

Immediately surrounding Petaluma there are over one million laying hens, making it the greatest poultry section of the world. Other places in the southern, middle, and northern parts of the State are very rapidly coming into prominence as poultry sections. The valleys of California that are well sheltered by the mountains and have an abundance of good water are admirably adapted to poultry-raising, and on account of conditions the smaller valleys are the best adapted. The growth has been enormous during the past decade. Hundreds of families of limited means have acquired small places and engaged in the poultry business, and are



POULTRY FARM OF THREE THOUSAND HENS.

not only realizing a fine livelihood, but many have bank accounts of no mean proportions.

The prospects for success are more promising than in the East or northern latitudes, for the climate precludes the necessity of extremely warm housing; hens run out every day in the year, hence have free and unlimited exercise; snow in the valleys is a phenomenon; the rains of our winters are beneficial to the fowls rather than a detriment to them, for it is then that vegetation is at its height.

Prices obtained for eggs and poultry average high, and although many are engaged in the business yet there is room for hundreds more, for the home production meets but little more than half the demand, and at the rapid rate at which California's population is being increased the demand for poultry and eggs is also increasing. Several hundred carloads of eggs and live poultry are sent from points in the Western States to the Pacific Coast markets during a year, usually to San Francisco and Los Angeles, to make up for the large deficiency in home production.

One peculiar and withal very desirable feature of poultry-raising in California is that large numbers of fowls may be allowed to roam together in perfect health without fear of disease being contracted. Such conditions in any other part of the world invariably

mean disaster to the flock, and this is another feature which greatly adds to the profit side of the poultryman's account. Some of the valleys present the appearance of one vast poultry farm, and upon ascending a prominence overlooking the same a scene is presented that would make an Eastern friend realize at a glance what superior advantages are possessed by the California poultrymen. A soil unequaled, a climate unapproached; the best and purest water in numerous places running down from the mountain sides; a sunshine warm and invigorating, but never too hot; natural green feed the year around, and with no cold or rigorous winters, necessitating specially constructed and oftentimes artificially warmed poultry houses—is it any wonder that California is fast becoming known as the poultryman's paradise?

One will naturally ask, Is it possible for any person to make a failure under all the favorable conditions? To which we answer

WHITE LEGHORNS.

in all sincerity and truthfulness, Yes, there are failures, by those who have sought this line of business on the ground that "any one can raise chickens," and having failed in everything else tries the one business of all which any one can conduct, according to his statement, and fails, because instead of managing it right, mismanages as he has done in other lines, while his neighbor with the same class of fowls and on similar land and in the same glorious climate, and using the feed that the market affords, continues to swell his bank account.

While the majority of those engaged in the poultry business keep flocks of hens for laying purposes (and the White Leghorn variety is used almost exclusively), there are others near the cities devoting their energies to duck-raising, while others in the interior where there is plenty of range raise turkeys in immense numbers, so that boys or men herd them during the day, much as a shepherd does his sheep. The writer has seen a flock of twelve hundred turkeys in charge of a boy with saddle pony and dog, and has been told of many larger flocks in the Sacramento and San Joaquin valleys. A very extensive duck-raiser near San Francisco informed me that during eleven months of last year he hatched and got ready for market 49,800 ducks and 1,485 chickens, and sold

off the ducks at eight and ten weeks of age, 10,000 at $1 each to the Chinese population, while the others brought from $6 per dozen to occasionally $12.

Here are also figures given by some who are conducting the poultry business in only a limited way. One man reports the following:

"I send you the result of a single year's work with 296 hens. Eggs and broilers sold, $1,110.12; gross cost of feed, $195.35; net, $918.76. Have had the hens divided into two yards, occupying about five acres of ground."

Another man reports as follows: "From a flock of 500 hens I have sold 3,723 dozen eggs, averaging 31½ cents per dozen, $1,170.98; 145 broilers at 42½ cents each, $61.35; 200 pullets at

SMALL POULTRY FARMS WITHIN CITY LIMITS OF PETALUMA.

50 cents each, $100.00; total, $1,332.33, from which deduct for feed of various kinds, $400.00, leaving a net profit of $932.33."

Hundreds of such instances as these could be given, but it is always safe to estimate on what the average person is making. It is placing a very low estimate to say that any person can count on a net profit of $1 per hen per annum; in fact, the writer does not know of any one who is not doing better than this.

From a recent issue of a San Francisco paper, the Pacific Rural Press, the following is taken: "That truth is stronger than fiction is deeply impressed on the judicious observer who visits Petaluma for the first time and takes note of the wonderful magnitude of the poultry industry. Twenty-six years ago Mr. L. C. Byce, now President of the Petaluma Incubator Company, settled in the quiet country village up the creek and determined to make it the greatest poultry center in the world. Working alone at the carpenter's bench he began the manufacture of incubators which have now become so justly famous. At that time there were few fowls in the State, but Mr. Byce's dream has been realized. The entire

country surrounding Petaluma teems with chickens, nearly all White Leghorns. The 'ranches' are small, usually consisting of five- and ten-acre tracts. The number of fowls owned by each farmer ranges from 500 to 8,000. Climate, soil, locality, price of feed and access to market, all contribute to the success of the industry, and hundreds of men are establishing themselves on little ranches, with the assurance that financial independence waits on intelligent management, industry, cleanliness, and perseverance."

One might infer from the above that a man can keep 8,000 fowls on a piece of land not to exceed ten acres; such, however, is not the case. All of the poultrymen in the vicinity of Petaluma who keep from 5,000 to 8,000 fowls have from 200 to 300 acres of land, on which the fowls roam at large, the colony system being employed; but there are those in other parts of the State employing the yard system, who keep large numbers of fowls on a small piece of ground. Each plan has its advocates, and there are many who are making good money on both plans. It is not so much the system as the ability of the man to handle the business.

Much has been said and written on the poultry industry of California, of the wonderful adaptability of soil and climate to the successful and profitable conduct of the business, and although hundreds of people have been attracted to the State to engage in poultry-raising, yet the output comes so far short of meeting the demand that there is room for hundreds more. San Francisco is of course the leading market, but in many other sections the local market, owing to existing conditions, is as good as that of San Francisco. The large number of vessels engaged in the trans-pacific trade leaving the port of San Francisco; the demands of the various and almost innumerable mining and lumber camps; the endless summer and vacation houses, and the monster hotels for tourists, all require enormous quantities of poultry and eggs, and California poultry-raisers must either produce the same or consumers will still have to look to the Western States to furnish them. It does not require much thought or investigation of the subject to determine how much more preferable is the fresh California product, and that should point the moral that there is room for more producers.

THE HONEY INDUSTRY IN CALIFORNIA.

BY GEORGE L. EMERSON.

Bee-keeping and honey-making in California differ materially from the same vocation elsewhere. The man who does not have two hundred stands or more is scarcely recognized as an apiarist; and when they speak of honey it is nearly always in tons rather than in pounds. There are a good many men in the southern part of the State who care for five hundred colonies or over; that is, they

do the expert work and their assistants take care of that part which can be left to those of less experience.

It is counted that a good apiarist can do all the work for two hundred stands of bees; while the same man, with the help of a green hand for two months, will manage about three hundred stands. Mr. Mendleson of Ventura handles fifteen hundred and sixty colonies with hired help, and makes both comb and extracted honey. Mr. Mercer, also of Ventura, cares for twelve hundred colonies, with the assistance of two men during the busy season. But few men could hope to attain the knowledge necessary to care for so many bees.

Southern California is literally the home of the bee. They can be found in the trees, rocks, houses, and even have been known to build in the branches of the orange tree exposed to the open air and there store in the summer under those conditions quite a number of pounds of surplus. Houses are favorite haunts, especially school houses and churches. They will go into the roof through the shingles, or around the windows they may find access to space between the studding; or perhaps they may find a way to the inside of the cornice, and even the chimneys—these they often choke up with honey until smoke refuses to take its wonted passage.

During a good season all these wild bees swarm repeatedly, and the consequence is that they are found in all likely and unlikely places. It is a common thing for a man who knows how and is willing to spend time to shake such swarms into a box to gather anywhere from twenty-five to one hundred swarms in a single summer. These bees are generally hived in anything that comes handy. I have bought them myself in anything from a bureau-drawer to a sugar-barrel, the prices ranging from 50 cents to $3 in hives. Bees in hives suitably located sell at from $3 to $5 per stand, and if the man is an experienced bee-keeper it pays to buy them in this condition; but if he is short of money he can gradually work into the business by making his own hives, buying cheap bees, and transferring them, catching stray swarms and taking them out of buildings, etc.

The writer and his brother own one thousand stands of bees, located in eight modern apiaries. Two years ago we produced sixty-five tons of extracted honey; last year we got forty-five tons. Taking the two years together I do not think that they could be considered better than average years. This would make an average of fifty-five tons per year. The honey sold at from 4½ to 6½ cents per pound, according to grade and market, but for convenience let us say the price was 5 cents, or $100 per ton, which is $5,500 per year. Two thousand dollars will cover the total expense. This leaves $3,500 net, and five months in which there is practically nothing to do except visit the apiaries once a month and see if everything is all right. We have not spent more than an hour's time a month at each apiary during the past winter, or from the first of October to the first of March, and our bees wintered splendidly.

There are some men who produce comb honey exclusively. Others produce both comb and extracted honey, while the majority prefer to handle only the extracted. I believe this to be a question for each man to settle for himself, as there are many different things to consider; but one thing is certain—it does not pay for any one to produce poor comb honey. The cost of production is equal to, if not more than, if it had been made when there was a good flow of honey, while the selling price may be reduced to one-half what a fine white comb of full weight will bring. In the extracted it does not vary so much. The extremes are not more than two cents per pound on the same market.

Some of the readers of this article may want to know about the flora to which we look to furnish feed for our bees. There are so many varieties of honey-producing plants and trees that space will not permit of a description or even the mention of all of them. Some of the most prominent are the black, white, and purple sages. [We claim that the black, or button sage, as it is sometimes called, makes the finest honey in the world.] Wild buckwheat, wild and cultivated alfalfa, also some of the immense bean-fields, furnish many tons of white honey for our bees. There are so many varieties of honey-producing shrubs that the ordinary bee man simply says of a certain one when he sees it, "Yes, that is all right, my bees work it," and never thinks of trying to find out the names of them all.

Among the trees the orange and eucalyptus are most valued, but the greater portion of plants and trees in this part of the country have some kind of a flower and the bees will work them according to their value compared to other flowers out at the same time. The black sage not only produces the best honey, but under favorable circumstances the flow is so heavy that bees will not touch anything else while it is at its height. I have seen an apiary of three hundred stands, in ten-frame Langstroth hives, fill every available space in four days and cap it solid. This shows how heavy-bodied it was when gathered, for ordinary honey has to stand in the combs a number of days before it is ripe enough to cap. This same honey was so white that you could not, while standing off a few feet, tell the difference between a tumbler full of it and another of water. We have kept it for four years in a Mason jar without sealing, and it did not granulate. When California has a really large crop, that is the kind of honey that perhaps one-half of it will be, while the rest will either come from other flowers or be mixed with them enough to make a decided change in color and flavor.

We roughly estimate that California can produce five hundred cars of fifteen tons each in a good season. This was done years ago, while we now have more bee-keepers and better ones, more bees and better facilities for handling them; and yet I prophesy that in a few years we will look back and see how small we were at this time; for there are unlimited acres of mountainous territory in this great State covered with a jungle of tangled shrubbery

(that can only be penetrated by the smaller animals) that breaks out into a profusion of bloom that is enough to gladden the heart of any lover of nature in its wild and unfrequented state; while it will certainly not only put the bees within its reach, but the bee-keepers themselves, to swarming.

My friends, the Eastern bee-keepers, if you are tired of chaff hives, or cellar wintering, or shoveling snow to get a path to the road—of working six months to prepare a living chance for the winter—follow the path and advice of thousands of others and come to a climate where bees have been known to swarm every month in the year; where the roses bloom in the winter and the children run barefooted all the year round. There is plenty of room for more, even if we are the largest producers of honey in the Union, and the chances are better now than ever before, for we have the California National Honey-Producers' Association to buy our supplies at the cheapest, sell our honey on a favorable market, and protect our interests at large.

THE BEET-SUGAR INDUSTRY OF CALIFORNIA.

By JAMES M. TAYLOR,
Manager Spreckels Sugar Company, Spreckels, Cal.

About the middle of the last century, fresh from a careful study of the conditions contributing to the successful growth of the beet-sugar industry in continental Europe, David L. Child, of Connecticut, made the first commercial attempt in the United States to manufacture sugar from the beet root. His efforts were met with a measure of success, and obtained for him a silver medal from the Massachusetts Charitable Mechanic Association, which pronounced his product as "well made, dry and of good grain," and "equal to sugar obtained from cane."

From this small beginning an industry has arisen which ranks in importance with the great industries of the day. This initial undertaking quickly took hold upon the public mind, and resulted in efforts conducted on broader lines, until we now have fifty-three operating beet-sugar factories, located in different states of the Union, with a capacity for working 42,000 tons of beets and producing approximately 5,000 tons of sugar per day, and which actually produced 233,100 tons of sugar during the season of 1903.

The beet-sugar industry of this country owes its immediate success to the pioneer effort of 1888, when Claus Spreckels built the plant at Watsonville, California. Nor was it alone the factory, built and equipped to the last degree in conformity with the best methods followed in Europe, that made possible the success of the

venture. Our soil and sunshine, our cool nights and warm days, our assurance of rain when needed, and of no rain when not needed; in a word, those great fundamental requirements, particularly in this branch of industry, became at once the potential contributors to its success.

The Pajaro valley, in which this first large success in the manufacture of beet sugar was achieved, represents a small section of country in the counties of Santa Cruz and Monterey. It is open to the bay of Monterey on the west, from which it derives the greatest benefits from the heavy summer fogs, supplementing an assured winter rainfall, and is otherwise inclosed by a low range of hills, and comprises in the aggregate less than 65,000 acres,

SUGAR-BEET FIELD AND FACTORY, SALINAS.

with about 6,000 acres of fine sedimentary soil, which has gradually been planted to beets. The surrounding valleys early took on the spirit of the new industry, and while the factory was operated, contributed to its success. But more than all, it established the farmer on a new line of husbandry, which has proven far more profitable than any of the other crops adapted to our soil and climate.

The success achieved here awakened an interest in other districts, even to the extreme southerly portion of the State, and all efforts to this one end have only served to confirm the opinions of soil experts, that the fundamental requirements for the successful raising of the beet root have been lavishly provided in California by generous Mother Nature. Except in the interior valleys, where the heat of summer has proven too great for the tender young

plant, it may be stated that nearly every locality influenced by the sea breezes to check too rapid growth, and having the proper quality of soil, is adapted to the growth of the sugar beet. This is abundantly proven in the development of the industry in this State.

Following the venture at Watsonville, the Alameda Sugar Company, having a plant of a daily capacity for working several hundred tons of beets, reorganized and rebuilt on a larger scale its factory located at Alvarado, in Alameda county, also near to tide water, and influenced also by the same general climatic conditions as are to be found in the Pajaro valley, which was followed closely in the order of construction by several other plants, as will be noted by the following list: In 1891 at Chino, having a capacity of 750 tons of beets per day; in 1898 at Oxnard, with a capacity of 2,000 tons per day; [both of these plants belong to the American Beet Sugar Company and are located in districts having great natural advantages of soil and climate, generally yielding satisfactory returns in the operating season;] in 1897 at Los Alamitos, having a capacity of 700 tons per day, and owned by United States Senator W. A. Clark; in 1899 at Betteravia, having a capacity of 500 tons per day, and owned by the Union Sugar Company.

The plant first in order as to capacity, and which sheds such renown on the name, was constructed in 1897, in the lower end of the Salinas valley, near Salinas, the county seat of Monterey county, by Claus Spreckels, under the corporate name of Spreckels Sugar Company. It was not intended in this article to indulge in remarks having a specific reference to the efforts of any one of the several successfully conducted plants of this State, but it is impossible to convey an adequate idea of the industry except by individualizing to some extent, and the indulgence of the reader is asked that a better understanding may be arrived at.

The plant of the Spreckels Sugar Company, which is the largest in the world with one exception, and that one in Belgium, was intended to meet all the necessities for both the present and the future of the entire section of the State where it is located; hence was built to operate by units, thus meeting the varying agricultural conditions of the section from year to year. Its capacity may be increased, at a very moderate cost, to 4,000 tons of beets per day. To perform this great task the most elaborate preparations have been made to insure the company from loss during the period of operation, by the installation in duplicate of practically all the machinery of the entire plant. The necessity of this will readily be understood when it is realized that the sugar beet has practically no keeping qualities, but is rendered unfit for milling in from ten to fifteen days after harvesting if allowed to lie exposed to the sun and weather.

To supply this factory with the necessary quantity of beets to keep it in continuous operation during what is known as the "campaign" requires the product of from 25,000 to 30,000 acres of land, furnishing employment in the work of producing the crop alone to from 2,500 to 4,000 men.

Experience has proven that the preparation of the soil for the successful cultivation of the beet root, while requiring special care in reducing the ground to proper tilth, not only improves the conditions bearing on the ultimate success of the crop in question, but in rotation with beans, potatoes, or even grain there is a large gain to each crop. This demonstrates that the most careful preparation of the soil is a prerequisite of success, a fundamental requirement in order to insure the largest returns. In support of this it need only be said that it is probably within the range of experience and observation of the management of every beet-sugar factory in our country that many farmers obtain only six or eight tons of beets per acre, as against others realizing a crop of from fifteen to twenty tons per acre, when the soil and climatic conditions appear to be identical; the cause for the difference in the yield being largely, if not entirely, due to the degree of attention given to the proper preparation of the soil for seeding.

The conditions to be met with in our State, governing the movements of the farmer, are also large factors bearing on the ultimate success of the beet crop. Situated as we are, climatically, we are reasonably certain of enough moisture in the soil from precipitation during the months of November to March inclusive to insure a good crop. To meet those conditions which are likewise found in all sections in the West where the cultivation of the beet root is successfully carried on, irrigation is resorted to, however, in a supplemental way, in order to insure the meeting of the moisture in the soil, which in California has been found not only of great value, but of prime importance, for the proper growth and development of the beet; and it may be stated as a recognized principle, that the sugar industry of this State must ultimately be conducted in localities and along lines where winter irrigation in the preparation of the soil for the next following crop must be followed.

The cultivation of the sugar beet as an industry in contradistinction to the beet-sugar industry—the one pertaining to and interesting primarily the farmer, while the other, being especially the work of the company which has invested its money in a factory, becomes at once a field of fine possibility in the realization of their hopes for profitable husbandry. The State affords many opportunities for that class of men engaged in agricultural pursuits who realize that he wins "who waits and watches, and who always works."

The cordial co-operation between the management and the grower or beet farmer is another point wherein the farmer and the factory alike realize their highest expectations. Their interests are mutual, their efforts should be identical, the sentiment of accord and fraternal exchange of views, opinions and experiences contribute alike to the success of each, and it may be stated as a necessary corollary that on the success of the farmer depends to a large degree the success of the factory operations.

The industry both as to the interest of the farmer and as to

that of the manufacturers has been so firmly grounded that all doubt as to the future has disappeared, and this alone offers an unusual inducement to those from other states, who, in looking for a field of profitable farming, can not fail in their efforts for success if a right selection of land is made in any of the districts now engaging the attention of beet-sugar manufacturers. It must be borne in mind, however, that the closest study of the conditions is necessary, and then the application of thought and intelligent labor, to make their efforts a success. To all such California offers fine inducements, and all would be welcomed.

COMMERCE AND COMMERCIAL RELATIONS OF CALIFORNIA.

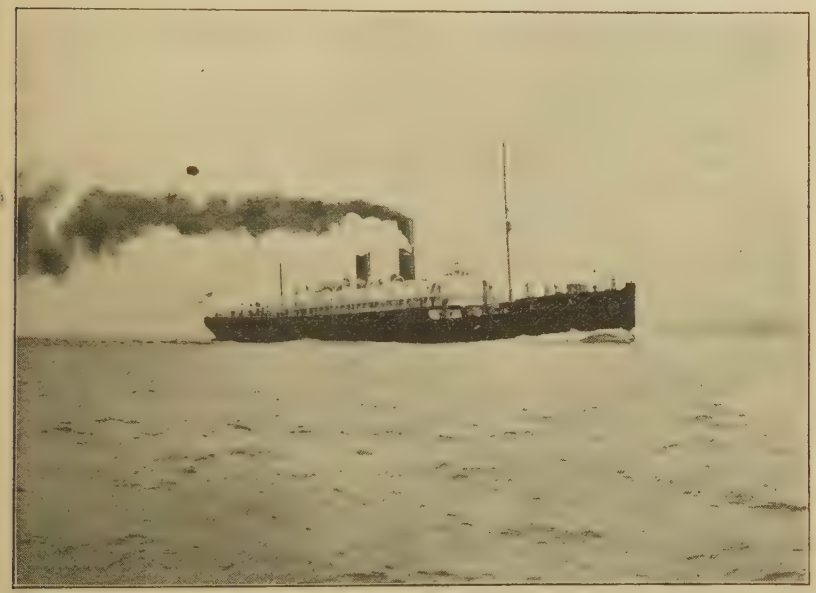
By JAMES D. PHELAN.

California has more than seven hundred miles of seacoast, and, with Washington and Oregon, represents, in a broad sense, the United States upon the greatest of the world's oceans. Surprising developments during the last few years have turned the eyes of the people from the land to the sea, and now the influence of the United States is speeding its way across an ocean which, like the Rocky mountains sixty years ago, was regarded as a barrier beyond which the activities of the republic would not go. In fact, Daniel Webster opposed the admission of California as a state as late as 1850 on the ground of its remoteness and inaccessibility, and Seward, the expansionist, answered him that, if it were not admitted, it was capable of becoming and would become an independent empire. Subsequently, Webster admitted his mistake and said he would rather own a town lot in San Francisco than a farm in Massachusetts.

The westward movement was, however, irrepressible, and the romance of the situation seems to be that it was foreordained and that statesmen and soldiers are merely the unconscious instruments to carry out the predestined course of civilization. Beginning in Asia Minor, civilization has constantly moved westward, first to Egypt, to Greece, to Italy and to Spain, covering the Mediterranean with ships and enriching every land with commerce; then it passed on to France and Germany, Great Britain and Ireland, crossed the Atlantic, penetrated the forests and the prairies, and finally reached the Pacific Ocean, and the twentieth century should see the orbit completed. The same civilizing power shall ultimately embrace Japan and all Asia. As the Atlantic superseded the Mediterranean, so the Pacific is fast taking the place of the Atlantic, and the shores it serves are far more populous.

William H. Seward, possessed of the keen vision which led him to acquire Alaska in 1867, predicted this marvelous change. He wrote: "Henceforth, European commerce, European politics, European thought, European activity, although actually gaining force, and European connections, although actually becoming more intimate, will nevertheless relatively sink in importance, while the Pacific Ocean, its shores, its islands and the vast regions beyond will become the chief theater of events in the world's great hereafter."

Nearly two-thirds of the population of the earth live in the lands washed by the Pacific. The growing foreign trade of Asia alone is valued at two billion dollars annually, and this is the trade for



BOUND FOR THE ORIENT.

which the nations of the world are struggling. The commercial supremacy of the Pacific is the engrossing question of the new century.

China contains within its vast area gold, silver, coal and rich agricultural lands awaiting intelligent industry for their development. Russia has pierced the continent with its trans-Siberian railroad and created, as in a night, cities and entrepots. Japan has already shown every evidence of its willingness and capacity to rank in enterprise and accomplishment with the other civilized powers. The Hawaiian and the Philippine islands have awakened from their dream of ages, and are making abundant contribution to the world's trade. The mines of Alaska are yielding up the treasures so long hidden from the sight of man, and the growth at our own

Pacific coast has taken its place, in the variety and volume of its mineral, agricultural and horticultural productiveness, among the wonderful events of the closing days of the nineteenth century. And now, with the beginning of the new century, the United States has taken up the world work, at which others have failed—the building of the Panama canal; and, it has the money and the men with which to complete it within eight or ten years' time. From these facts, it will appear that the commerce and the commercial relations of California constitute a subject of increased interest, and that this fair country, with the most productive of nations behind and the greatest of oceans before it, is destined to become the center of a mighty empire in all that constitutes commerce and trade and in all that makes for science and art.

The beginnings of commerce in California were very primitive. The Spanish navigators, lured by stories of fabulous wealth, sailed up the coast from Mexico, but found little or nothing to justify their ventures. Later, Sir Francis Drake visited the Californian coast and beached his "Goulden Hinde" for repairs just outside the Golden Gate, of which he had no knowledge; nor did he discover San Francisco bay, which was reserved for subsequent discovery, nearly two hundred years later, by the Spanish missionaries from the land. Cabrillo discovered the Californian coast in 1542. Drake anchored off the coast in 1579, and Portala and party beheld San Francisco bay in 1769.

The next interesting record was Richard H. Dana's "Two Years Before the Mast," wherein he describes the trade in hides and tallow between San Francisco and Boston. Then, in 1848, followed the discovery of gold, which brought a brilliant company of adventurous men to California, who laid the foundation for the State. Mining and subsequently agriculture and horticulture prospered side by side, and in 1867 the Central Pacific Railroad divided the business of transportation with the steamers which by the Panama route had served this coast, and the sailing vessels which rounded the "Horn" had begun to carry to Europe cargoes of California wheat, a cereal ranking in the markets of the world as of first quality. The banner year for wheat exportation was 1882, when 22,279,000 centals, valued at $36,000,000, were shipped.

The discovery of gold in the Klondike, the acquisition of Hawaii and the Philippines, and the stirring events on the Asiatic coast opened the sea to the trade and commerce of California, and fleets of ocean steamers have been commissioned to meet the demands of the growing trade. The Government maintains a transport service, and fine steamers regularly come and go on Government business between San Francisco and Honolulu, Guam and Manila. The Pacific Mail Steamship Company has six steamers for the Oriental service. The Toya Kisen Kaisha, a Japanese line, has three modern vessels, at this writing temporarily withdrawn on account of the war. The Occidental and Oriental Steamship Company has three steamships regularly on the route. These ships run to Tahiti and the other islands of the Pacific; and the Oceanic Steamship

Company maintains service between this country and Hawaii and Australia. The Kosmos line of steamers gives monthly service to Europe via South and Central American ports, and the Pacific Coast Steamship Company serves the Pacific seaboard. The new steamers are of the fastest type, and the latest, the Korea and the Siberia of the Pacific Mail, each measure 572 feet in length, and the Mongolia and Manchuria measure 600 feet in length. These steamers can make the trip across the Pacific from San Francisco to Yokohama, 4,720 miles, in ten days; and from Yokohama to Hong Kong, 1,620 miles, in three and one-half days; and to Manila, 642 miles farther, requires another day and a half.

While many of these steamers have been built in the East, owing among other reasons to the crowded condition of San Francisco yards, it may be stated incidentally that shipbuilding in California is a prominent and growing industry, and many large ocean-going steamers have been constructed for commercial service during recent years; but the triumph of the shipbuilding art may be found in the formidable fleet given to the sea by the Union Iron Works of San Francisco in the cruisers, gunboats and battleships, many of which are known to fame, such as the Charleston, San Francisco, Monterey, Olympia, Marietta, Wheeling, Farragut, Wisconsin, Wyoming, Perry, Preble, Paul Jones, Grampus, Tacoma, Pike, Ohio, California, and above all, the matchless Oregon, which made the race from Puget sound, around the Horn, in the face of the enemy, and arrived before Santiago ready to engage in the action of July 4, 1898. The Chitose, a Japanese cruiser recently mentioned for brilliant service in the Japanese war, is also a product of this yard. Besides these, sailing vessels have been built, averaging about twenty a year since 1887; and steam vessels averaging more than that per year during the same period have been constructed in San Francisco bay.

On the Atlantic seaboard there are numerous harbors, but on the Pacific littoral there are practically only five or six harbors adapted to the requirements for large shipping operations, namely, San Francisco, San Diego, San Pedro and Eureka, in California, and the Columbia river and Puget sound. San Francisco bay, of course, is the principal one. It is the most spacious and best protected harbor on the coast, and its central position makes it most advantageous for coastwise and Oriental trade. It is thoroughly well fortified by modern guns and is equipped by two dry-docks, privately owned, one having a capacity for the largest vessels afloat; and two stone dry-docks, belonging to the Government, are located at Mare Island Navy Yard in San Francisco bay, and there are besides floating docks, well adapted to sailing vessels and smaller craft. Ships can anchor safely in almost any part of the 460 square miles constituting the bay of San Francisco.

San Diego harbor is also landlocked and is well adapted for ocean commerce. The bay is 13 miles long and has an area of 22 square miles, with an available anchorage of 6 square miles. The Government is now dredging the harbor to a

depth of 30 feet and extending a jetty to 7,500 feet. The Pacific Coast Steamship Company's steamers touch at San Diego, and lumber craft and colliers ply between this and other ports. Steamers of the Kosmos line and of the Hawaiian-American line visit this harbor. The value of imports for eleven months ending November 30, 1903, amounted to $459,856, with an export value of $311,924. The amount of duty collected during the same time was $63,704. The principal articles imported were cement, coal, Mexican onyx, cattle, guano, copper ore and pig iron. Total tonnage for the year, 260 steam vessels (238,566 tons), and 115 sailing vessels (38,909 tons).

The Government is now enlarging the natural harbor of San Pedro by constructing a great breakwater. This is the port of Los Angeles. Los Angeles also has the harbors of Santa Monica and Redondo.

Eureka is the shipping point for the lumber of Northern California. Its shipyards build $2,000,000 worth of ocean tonnage each year. As an example, Humboldt county shipped in shingles 697,533,000 and in shakes 17,939,000, and of nearly a million dollars in value, or over 34,000,000 feet of redwood lumber was shipped from the same port in 1903. Vessels sailing from Eureka to all foreign ports for that year showed that in forty cargoes there was a net tonnage of 36,000, carrying total board feet of 21,201,000.

In this connection it may be interesting to state that the total lumber product of California for 1903 is estimated at 792,000,000 feet. The arrivals of pine, spruce and fir at the port of San Francisco for 1903 amounted to 366,653,000 feet.

But the shipping statistics of the port of San Francisco are necessarily more typical of California than the shipping from minor ports. In a representative year, 1902, the clearances from San Francisco by sea showed: Flour, 1,188,884 pounds; wheat, 8,237,782 centals; besides oats, corn and rye among the cereals. The receipts for the same year were: Flour, 6,974,000 qr. sacks; wheat, 9,120,000 centals; barley, 5,943,000 centals; besides oats, corn, rye, beans, potatoes and other products.

Over one million barrels of flour passed out through the Golden Gate during 1903, and in return therefor over $4,000,000 was realized. Wheat and barley exports from San Francisco during 1903 are in excess of $7,500,000. The total value of dairy products for the year is estimated at $16,000,000. The value of the manufactures of San Francisco in 1903 was $150,000,000. A brief summary of California products will show the articles which may be exchanged in the markets of the world.

In 1902, the mineral production represented a total value of $35,069,000. Almost every mineral was represented, and more particularly, and in the order named, gold, petroleum, copper, borax, quicksilver, brick clay, silver, lime, macadam, asbestos, granite, sandstone, slate, etc.

The crop of sugar beets for 1903, estimated at 620,000 tons, yielded 77,000 tons of sugar; hops, 47,000 bales, or 9,310,000

pounds. Wool products amounted to 22,000,000 pounds; honey, 3,650,000 pounds. In the year 1902, 19,180 carloads of citrus fruits were shipped, equal to 6,904,000 pounds. The California raisin crop for 1902 was 108,000,000 pounds; of prunes, 115,000,000 pounds; and other dried fruits were as follows: peaches, 50,000,000 pounds; apricots, 37,000,000 pounds; apples, 9,000,000 pounds, and so on as to pears, plums, nectarines, grapes and figs. In 1902 there were 7,141 cars of fresh and deciduous fruits shipped out of the State. All the shippers have agreed in maintaining a distributing agency at Sacramento, whence the cars are shipped by a manager according to the demands of outside markets. By this means the glutting of the markets has been prevented and more satisfactory returns made to shippers.

Canned fruits to the extent of 2,600,000 cases were shipped in 1903. Each case contains a dozen 2½-pound cans. Almonds and walnuts, respectively, of 6,000,000 and 11,000,000 pounds, were produced, and of the great wine industry, 22,000,000 gallons of dry wines, 10,000,000 gallons of sweet wines, and 5,700,000 gallons of brandy is the record. The following is a summary of San Francisco's trade by sea during 1903:

EXPORTS.

To foreign countries	$31,772,113
To Hawaii	10,518,555
To Alaska	2,934,626
To Tutuila (Samoa)	47,946
To Guam	21,968
To Midway Island	10,654
Foreign merchandise in transit	878,135
To Atlantic States	5,368,252
Total value all exports	$51,552,249
Shipments on United States transports	1,440,000
Total value, including transport shipments	$52,992,249

Shipments on United States transports are not filed at the custom house. The Government shipments on chartered vessels are, however, manifested the same as if shipped by private parties.

IMPORTS.

From foreign countries	$32,651,650
From Atlantic States	3,870,537
Value of all imports by sea	$36,522,187

The above does not include coastwise trade or imports from non-contiguous territory of the United States. Also, the above item from Atlantic States means merchandise from foreign countries landed at other ports and sent by rail to San Francisco.

In addition, there was imported $13,975,000 of treasure.

Summary of San Francisco's trade by sea during 1903 (exclusive of transport freight, unknown quantity, and treasure, $3,680,000):

Exports	$51,552,249
Imports	36,522,187
Total volume of merchandise traffic	$88,074,436

There are no available figures showing merchandise imports and exports by rail, but it is variously estimated at from $120,000,000 to $140,000,000 per year for the State.

The customs receipts at the port of San Francisco for the year amounted to $7,850,705. This would have been nearly $9,000,000 were it not for the fact that the 67 cents per ton duty on coal had been removed for the year (but is now restored) and the 60 cents duty taken off tea. Coal has now to compete with the native fuel, petroleum oil, of which in California there was, in 1903, an output of 23,602,000 barrels.

The imports consist principally of teas, coffees and spices, rice, iron and iron products, cement, coal, silks, Chinese and Japanese wares, opium, hemp, jute, sugar and spirits. Of the total value of imports the following items are the largest: Raw silk, $11,631,000; manufactured silk, $552,000; coffee, $2,962,000; tea, $999,000; tin, $735,000; bituminous coal, $2,526,000; manufactured fibers, $2,253,000; opium, $1,139,000; cement, $486,000; manufactured cotton, $410,000; earthenware, $342,000; hides, $433,000; spirits, wine and malt, $998,000.

San Francisco ranks after New York, Boston and Philadelphia in custom-house receipts.

Referring to the general field, the growing trade of California on the Pacific has been greatly stimulated by the laying of the Pacific cable, last year, from San Francisco to the Hawaiian Islands, and thence to Wake Island, Guam and the Philippines, about 6,700 miles in length. As a consequence, during the last few months San Francisco has become the center and distributing point of war news from the Orient, taking the place which London formerly enjoyed in this respect. There is also a new cable from Vancouver via Fanning, Fiji, Norfolk Islands to Auckland, New Zealand, and Brisbane, Australia.

But the event which will revolutionize the Pacific trade, and which will confer an additional benefit upon California, is the certain construction of the Panama canal. The United States has, at length, undertaken the work, provided the means and appointed a commission, which expects to complete the great enterprise within ten years. Students of commercial geography have for four centuries fully comprehended the importance of an isthmian canal to the commerce of the world. During all this time various contentions have prevented the beginning of the work, but now, at last, its accomplishment seems certain. It is the opinion of careful observers that it will give commercial primacy in the Pacific Ocean to the United States, and as California, with San Francisco as its entrepot, holds a unique position, the benefits that will accrue to the United States will be felt in every section of this State. It will stimulate industry by giving a wide field to the products of mine, field and shop. In other words, the awakening of the Pacific can not but redound to the benefit of California. The Pacific Coast will have closer commercial relations with Europe, whence it can receive a desirable population and find a market for its

products. It will reduce the cost to California of all its imports and increase the value of all its exports by cheapening transportation; and, it will make San Francisco and San Diego, for this reason, great distributing centers.

The people of California are fully alive to the importance of their position, and will be equal to the opportunities which the changed conditions will present. In the University of California there has been established a college of commerce to train the young men of the State in the methods of business and to impart a knowledge of the productions and needs and the commerce of other lands.

The Pacific Commercial Museum, patterned after the excellent institution in Philadelphia, has been founded in San Francisco, where our merchants keep in touch with the commerce of the world, studying the needs of foreign places for the purpose of supplying them. The Chamber of Commerce of San Francisco, as its name implies, looks particularly after the commercial interests of the port, receives distinguished visitors, acts upon all measures of interest to the mercantile world, and maintains an agent in Washington to promote favorable legislation. The Merchants' Exchange, which has just erected a monumental building, cares particularly for the shipping of the port; and the State and City Boards of Trade, Manufacturers and Producers' Association, the Merchants' Association, and the California Promotion Committee are organized for the purpose of advancing the interests of the city and State, not only on commercial lines, but in matters of immigration, production and civics.

It is, therefore, safe to conclude that endowed as California has been so richly by Nature and favored so signally by her peculiar position upon the Pacific, her citizens have not been backward to assume the responsibilities and to wield the power which have been put into their hands, to the end that the commercial interests of their country and their State may be fostered, promoted and advanced.

The poet Byron beautifully describes Venice at the height of her maritime supremacy, and the same language may be used of San Francisco, the chief port of California, now that the sceptre has passed from the Mediterranean to the Pacific:

"She looks a sea Cybele, fresh from ocean,
Rising with her tiara of proud towers
At airy distance, with majestic motion,
A ruler of the waters and their powers:
And such she was;—her daughters had their dowers
From spoils of nations, and the exhaustless East
Pour'd in her lap all gems in sparkling showers.
In purple was she robed, and of her feast
Monarchs partook, and deem'd their dignity increased."

MANUFACTURES OF CALIFORNIA.

By CHARLES E. BANCROFT,
Secretary of Manufacturers and Producers' Association of California.

The productive resources of a locality having generally a controlling influence upon the occupations and prosperity of its people, so the native wealth of California in minerals and in forests and in other natural resources and the productive capabilities, under cultivation, of its soil and climate, have largely governed the industrial history of the State, including the growth of its manufactures. Broadly stated, these natural and cultivated products cover the following wide range: Gold, silver, copper, petroleum, building-stones, borax, salt, soda, slate, clay and other minerals; redwood lumber, white pine, sugar pine and other forestry products; wheat, barley and other cereals; pasturage, hay; nearly every cultivated variety of fruits and vegetables known in the world, excepting some of those of the extreme tropics, but including deciduous, citrus and other semi-tropical fruits, grapes, nuts, olives, etc.; livestock; dairy products; poultry; fisheries, etc.

With a brief territorial existence followed by admission to statehood in 1850, its people chiefly engrossed in mining during the ten years following; isolated in large measure from the rest of the world until the completion of the first transcontinental railroad in 1869, and dependent for coal supply mainly upon importation from Great Britain, Australia, Oregon and Washington at a cost of $7 or $8 per ton, California has plainly rested under disadvantages in respect to manufacturing. Great achievement in that class of industry might not, therefore, be expected, and yet it is to be seen by the United States Census Report for 1900 that California ranked in that year next to Connecticut in value of manufactured products, or twelfth in the list of the states, the value of these products of the State being placed at nearly $303,000,000, a gain of fifty per cent since 1890. This value is about two and one-half times that of the manufactured products of Maine, Louisiana or Texas. But the most important growth of these industries in California has occurred since the figures of the Twelfth Census were prepared, the obvious causes being found in increasing population and in the general development of all its resources and markets which is now irresistibly proceeding. Among these developments, and occurring most opportunely to meet the needs of manufacturing, is the complete solution of the question of power, principally through the discovery and the production of petroleum in vast quantities, and through the utilization of water power in the creation of electrical energy on a scale, and with audacity in long-distance transmission, not paralleled elsewhere in the world.

The output of crude petroleum in 1903 reached approximately 23,000,000 barrels, an increase over 1902 of about 11,000,000 barrels, and there is every indication of an annually increased yield. This present production amounts to 15½ barrels of 42 gallons each for every inhabitant of the State. Three and one-half barrels are equivalent to one ton of coal. The commercial production of petroleum at the present time extends over an area of about one-half the length of the State, with good existing facilities for its transportation by water, rail and pipe-line to non-producing localities.

Activity in the development of electric power from the use of water has continued until the various plants of the State, with 2,200 miles of transmission circuit, have a total voltage of about 145,000 horsepower, while the present voltage of such plants in all the remainder of the United States, with 1,200 miles of transmission circuit, amounts to about 215,000 horsepower. The possible future supply, in nearly all parts of California, of electric power generated by water is practically without limit.

It is, moreover, to be said that, adjacent to the tide waters of San Francisco bay, an excellent steam coal is now available in large quantity and is being mined and sold at a price lower than offered at any previous time. Native California coal is also utilized in the manufacture of prepared fuel, as in the case of "briquettes." An extensive plant is about to begin operations in the making of "carbonets," the method of this manufacture being entirely new. It granulates, but does not powder the coal; shapes, but does not employ heavy pressure. In the opinion of experts it is likely to form a turning point in the manufacture of artificial fuel. The product is likened in its action as a fuel to a hard bituminous coal, the blocks splitting open and forming a coke, the gases being released only so fast as the fire will consume them, so furnishing a smokeless coal suitable for all purposes where anthracite coal is now thought to be indispensable.

Thus California possesses and is commercially utilizing abundant sources of cheap power both for transportation and for manufacturing of all classes, and is fully assured of this advantage for the future.

Among leading manufacturing industries of the State in 1900 may be mentioned sugar and molasses refining, slaughtering, lumber and timber productions (including those of planing mills), flouring and grist mill products, fruit and vegetable canning and preserving, foundry and machine shop products, clothing, dairy products, explosives and ammunition, leather, wines, brandies and malt liquors, and printing and publishing.

Mining made early demand for machinery and appliances required in that industry, progressing from the cruder methods of placer mining, with only the simplest mechanical means, to mining in all its branches, aided by the employment of machinery of the highest usefulness and efficiency, which has been largely originated in the State and turned out by its shops. This includes

stamp mills, hydraulic mining machinery, air compressors, rock drills; amalgamating, concentrating, pumping, smelting and dredging machinery; boilers, engines, etc. Other foundry and machine-shop products include traction engines, brass manufactures, which are among the oldest of the State; well-boring appliances, gas engines, heating, ventilating and refrigerating apparatus, stoves and ranges, waterwheels and motors, and other machinery of all kinds. Shipbuilding in iron and steel, as well as wood, has become within the past twenty years one of the large manufacturing industries of the State.

In agriculture, there being found conditions of soil and climate differing in important respects from those under which agricultural and horticultural operations were conducted elsewhere, as well as a greater variety of conditions and opportunity for a greater diversity of crops, the farmer of this State soon sought implements and machinery better adapted to his needs than those commonly in use. The demand has been met by our manufacturers in such manner, by improvement upon former models, in material used and in workmanship, and by invention of appliances and machinery, that it may fairly be stated that the various kinds of implements and machinery made here furnish the greatest efficiency and economy in the uses for which they are designed and are of unusual strength and durability. To these facts may be attributed a good share of the success obtained in the growing and harvesting of our great variety of agricultural products. Included in the manufactures of this class are plows, harrows, cultivators, grain-headers, threshers; the great combined harvesting machines, which cut, thresh and deposit the sacked grain by one operation; grain and seed drills and sowers, hay forks, rakes and stackers, etc.

As of interest in connection with the development of the fruit industry is to be noted the manufacture of irrigating machinery, cans, fruit jars and cannery appliances, fruit graders, presses, processors, evaporators, picking appliances, hoppers, trays, special plows and cultivators for orchards and vineyards, fruit-tree sprayers, and other appliances, many of which are of original device and manufacture in this State and materially aid in the planting, growing, harvesting and marketing of fruit.

Among other manufactures are bags for grain, fruit, etc., bellows, belting and hose, bolts, nuts and screws, boots and shoes, terra cotta and other clay products such as sewer and water pipe, etc., candles, chemicals, confectionery, cooperage, cordage (one of the old and important manufactures of the State), cotton manufactures, elevators, fireworks, furniture, gas and electric-light fixtures, glass (bottles, fruit jars, window glass, art glass, etc.), gloves, harness, hats and caps, incubators (recognized and in demand all over the world for their high order of efficiency), jute manufactures, lead manufactures, mantels, metals, mill and cabinet work, organs and other musical instruments, paints and varnishes, perfumery, petroleum refining (including asphalt and refined oils), pharmaceutical preparations, Portland cement, roof-

ing materials, rubber goods, safes and vaults, sheet metal work, scientific instruments, silk thread manufactures, smelting and refining, soap, starch, tanks, typefounding, trunks and valises, wagons and carriages, wirework (including wire rope and cables, fencing, netting, specialties, etc.), and woolen manufactures (including the famous California blankets).

The conspicuous importance of California as a food-producing state is not to be lost sight of. It is safe to say that the State is to become one of the principal sources of food supply for the world in its production of cereals, by reason of the many forms in which its fruits and vegetables are and may be cured or otherwise preserved, in its leading position in the production of pure wines of the best types and in rapidly increasing quantity, in the fishery products which its own waters yield and which come to it from the great salmon and cod fisheries of the north, in its dairy and other livestock and poultry products, and in its manufactures of baking powders, biscuits, chocolate and cocoa, flavoring extracts, olive oil, soda, starch, sugar, syrup, etc.

With conservatism of statement, the advantages and opportunities for manufacturing which California presents may therefore be summarized as follows: A climate conducive to health, to enjoyment of life and to the fullest measure of the product of labor owing to the absence of extremes in heat and cold; great areas of tillable land richly productive in raw material; extensive forests of redwood, white pine, sugar pine and other woods; inexhaustible deposits of iron ore awaiting only the discovery of methods of smelting through the use of petroleum or perhaps of electricity, and great variety of other minerals; motive power limitless in supply and low in cost, and the prospective widening of markets through the extension of the railroads of the continent, through the further opening of trade with Pacific Ocean countries and through the building of the Panama canal—these improving transportation facilities bringing to us also the raw materials of many lands to feed our factories, a present instance of which may incidentally be cited in our importation of hides which are here tanned through the medium of California oak tanbark, the best tanning agent obtained in the United States without cultivation, and to the good qualities of which is partly to be attributed the established superiority of California leather.

BANKS AND BANKING.

By J. K. LYNCH,
President of the California Bankers' Association.

The history of banking in California gives in a brief fifty years an epitome of the evolution of banking throughout the world. Unlike most frontier communities, California had from the beginning a circulating medium ready at hand—gold; not minted and coined, but divided into nuggets and dust easily weighed, or for some purposes more crudely measured by the "pinch," which we are told made thick fingers valuable to the barkeeper! The primitive safe deposits (buckskin bags and yeast-powder cans, buried or cached) answered for a time, but the need for available deposits soon developed, and the storekeeper became the banker. Banking was thus at first a side line before it became a business, but as early as 1849 there were five private banking firms in San Francisco, several in Sacramento, Sutter's Fort and other places in the interior. Some of the names connected with these early firms have come down to the last decade—Sather and Tallant, for instance; while the express and banking corporation, Wells, Fargo & Co., is the successor of the firm that carried gold in the fifties.

The unusual financial conditions presented by an isolated community with infrequent communication and alternate scarcity and glut of merchandise, together with rapid fluctuations in the prices of real estate, proved fatal to many of the early ventures. The failures of Adams & Co., Page, Bacon & Co., and other of the pioneer bankers, led to a popular distrust of private banking firms, and favored the establishment of strong, incorporated concerns. The Bank of California, incorporated from the private bank of Fretz, Ralston & Co. in 1864, is still the leading commercial bank in the State.

The first incorporation for a savings bank was in 1857. The first national bank was chartered in 1870; the first trust company in 1882; while the close of the century saw all four classes of institutions firmly established and forming a financial system of which any state might be proud.

Commercial Banks.

The early banks were merely offices where gold dust was exchanged for some form of current coin or drafts, and every steamer leaving for Panama carried shipments of gold to meet the drafts sold. Banks of deposit, where funds were held subject to check, was the next step, and the discount and loan features soon followed.

The magnificent harbor afforded by the bay of San Francisco, which as early as 1849 was crowded with shipping, marked the

city as one of the commercial centers of the world, and banks to care for the needs of commerce were a necessity. As San Francisco is cosmopolitan in its population, so it is cosmopolitan in its banks, and the buying and selling of bills of exchange on the principal cities of the world, the issuing of credits for travelers' use, and of commercial credits for the purchase of merchandise—all these are a regular part of its bankers' business. Facing the Orient, whose products have always been the subject of important commerce, San Francisco banks issue credits for the purchase of teas, coffees, spices, silks, jute and matting, and pay for them in London, still the "clearing-house of the world," with the proceeds of the wheat, salmon, canned fruits, wine and other articles of California production which the big ships carry 'round the "Horn" to Europe.

Now that the Hawaiian and Philippine islands have been added to our possessions, the volume of our commerce is greatly increased, and with it the opportunities of the banker. The question of the "open door" in China, which is now involved in the war between Russia and Japan, is one of great interest to the banker. The answer must be a matter of uncertainty for some time, but the hope is not unwarranted that it will be decided in favor of commercial freedom. Another equally vital question is that of the Panama canal, which now seems an assured fact. The results of such diversion of the world's commerce are too far-reaching in their character to be accurately forecast. Considered from a purely local and selfish standpoint, there has been much difference of opinion as to the effect on San Francisco's trade; but the best opinion seems to be that while there must be some diversion of traffic, the shortening of the waterway to the Eastern States and Europe must result in an increase of commerce, and consequently, in the field for the commercial banker. It is worthy of note that, while from the very beginning, San Francisco's bankers have been familiar with questions of world exchange and trade, some of the New York banks are only now organizing exchange departments and tendering their services to the provincials on this side of the continent.

What has been written about San Francisco as the leading commercial city of the State, applies in some degree to many of the interior cities. The shipment by rail of fruit, both fresh and dried; of beans, barley, and other products, affords a large volume of domestic exchange, which is handled by the banks of Los Angeles, Fresno, San Jose, Sacramento and other points in the interior.

The story is best told by the figures. At the date of the last complete report to the Bank Commissioners, September 8, 1903, 32 San Francisco commercial banks had a capital and surplus of $48,705,019, and deposits of $118,779,057; 242 interior commercial banks had capital and surplus of $41,742,600, and deposits of $127,303,658; making a total for the State, 274 banks, with capital and surplus of $90,447,619, and deposits of $246,082,715.

Savings Banks.

The high wages and large salaries, with comparatively cheap living expenses in San Francisco, constituted a fine field for saving in the later fifties and early sixties. The easy fortunes made in mines, and the speculative disposition developed by mining, and natural to an adventurous class of men and women, were hardly conducive to thrift; but institutions to foster the saving habit were started, and the men on whom the management devolved have ably and honestly administered the trust reposed in them. The first savings incorporation was that of the Savings and Loan Society, in July, 1857, and it still holds its place among the leading banks of the State. It is worthy of note that its first dividends to depositors were at the rate of *eighteen* per cent per annum; that in 1866 it was paying twelve per cent, and as late as 1878, eight per cent per annum. From that date, the fall of interest rates to approximately those prevailing in the Eastern cities was rapid. For some years the interest paid to the depositors in California savings banks has ranged from three to four per cent. The Hibernia Savings and Loan Society, incorporated in 1859, is a purely mutual concern, having no capital stock; yet now holding deposits of fifty-six millions of dollars—larger than those of any other institution west of Chicago. The San Francisco Savings Union, incorporated in 1862, and the German Savings and Loan Society, incorporated in 1868, have deposits of thirty-two and thirty-five millions of dollars, respectively.

Though the savings banks had a good field for gathering deposits, the field for loaning them was more restricted, being for many years confined to real estate. Amid the booms and collapses in values inseparable from the rapid growth of new communities it is a matter of congratulation that so few fell by the wayside, and that of those which fell, but one or two showed reckless management.

While San Francisco was developing the large savings banks above mentioned, and other smaller but no less secure banks, strong savings institutions had grown up in Oakland, Los Angeles and many other towns in the interior. On the date before mentioned, 9 savings banks in San Francisco had capital and surplus of $10,434,577, and deposits of $151,421,212; 59 interior savings banks had a capital and surplus of $6,631,383, and deposits of $61,474,317; making a total for the State, 68 banks, with a capital and surplus of $17,065,960, and deposits of $212,895,529.

National Banks.

Previous to 1854 the current gold coin in use was principally from the private mints of Kellogg, Hewston & Co., Wass, Mohlitor & Co., and Moffatt & Co., while the silver was a miscellaneous collection of foreign pieces. In that year the United States Branch Mint at San Francisco was opened for coinage. This gave an abundant supply of money for business purposes, and the people became accustomed to metallic money, and entirely unfamiliar with the bank-note circulation of more or less uncertain value which was current in the Atlantic States. During the Civil War, when

Congress issued treasury notes, or greenbacks, as they were called, Californians refused to have anything to do with them, and to the end California remained on a specie basis. Merchants generally refused to take advantage of the act permitting them to discharge obligations previously contracted on a coin basis in depreciated paper. The few who did not live up to this convention were looked on with great disesteem, and a special mark stood against their names in the mercantile agency books, meaning, "Pays in greenbacks." This action had a decided and lasting effect on California finances, by preventing the great inflation of prices which later caused such disaster in the East. It was possible only on account of the isolated position which California occupied at that time, and, while it has been called a disloyal act on the part of a distinctly loyal State, it was more than made up by the steady stream of gold which she poured into the national coffers during this most critical period.

In the northern and central parts of the State, the nationals increased slowly, and for several years there was but one national bank in San Francisco. The First National Bank of Los Angeles was chartered in 1880, and was for some years the only national bank in Southern California. In fact, at that time, there were but two other banks in Los Angeles. The great movement which settled up that section in the later eighties was made up of men from the Eastern States, already familiar with the national system, and banks were incorporated under that system throughout all the towns of the south, Los Angeles alone having eight at the present time. The national system has spread gradually through the central portion of the State, and is growing in popularity, more banks being chartered as national or converted into nationals every year. On September 8, 1903, the figures were: For San Francisco, 7 banks, with a capital and surplus of $12,035,227, and deposits of $27,916,373; for the interior, 57 banks, with a capital and surplus of $12,918,498, and deposits of $67,072,531; making the total for the State, 64 banks, with a capital and surplus of $24,953,725, and deposits of $94,988,904.

Foreign Banks.

The position of San Francisco on the western edge of the continent, with the broad Pacific in front, and the gold fields at its back, proved attractive to foreign capital from an early date. Among the first foreigners to open here were the French. The house of Pioche, Bayerque & Cie. is an example, while the great French bank, the Comptoir National d'Escompte de Paris, has only recently closed its agency, to be succeeded by the Russo-Chinese Bank. The Swiss were represented by F. Berton & Co. and A. Borel & Co. The Rothschilds maintained an agency for many years, which was turned over to the Bank of California. The Seligmans began as private bankers, and then incorporated as the Anglo-Californian Bank, Limited. The Lazards became the London, Paris and American Bank, Limited. The London and San Francisco Bank, Limited, was the result of the efforts of Milton S.

Latham, once Governor of California, to interest British capital in the State. Canadian banks, like the Bank of British Columbia and the Bank of British North America, found agencies in San Francisco a good outlet for surplus funds. Exchange banks, like the Hongkong and Shanghai Banking Corporation, found San Francisco a necessary link in the chain they were putting around the world. These banks have been an important factor in the development of the State, and their control of funds from points where there was no pressure an element of safety in times of danger. They have never been numerous enough to dominate the situation, and with the increase of strong domestic institutions, their importance is becoming relatively less.

Private Banks.

The business of the State was at one time exclusively in the hands of the private banker, and some of those who survived the disasters of the fifties established reputations that carried them almost to the close of the century. The increasing magnitude of business required amounts of capital more easily handled in the corporate form, and, besides, the spirit of the times seemed to favor corporations. With the passing of the men who had made the banks, the names ceased to have a value, the personality that animated them evaporated, and one by one, with but few exceptions, they have either incorporated or liquidated. In the entire State, at the date of the last report, there were but nineteen private banks, all but one outside of San Francisco. They showed capital and surplus of $1,119,709, and deposits of $2,551,334.

Trust Companies.

The trust company, this end-of-the-century financial marvel, was slow in taking root in California. The savings banks had taken on the care of large deposits belonging to estates, and other dormant funds, which is the most important part of the trust company's business where it has reached its greatest development. Besides, the California mind has not fully grasped the idea of the corporate administration of trusts and estates. Nevertheless, the trust company is now firmly established. San Francisco has four strong institutions, and Los Angeles has three. The figures are—capital and surplus, $5,959,000; deposits, $23,884,000.

GRAND TOTALS.

	Capital and Surplus.	Deposits.
Commercial banks, including national banks and trusts companies	$90,447,619	$246,082,715
Savings banks	17,065,960	212,895,529
	$107,513,579	$458,978,244

Failures and Panics.

With the exception of the runs which led to the closing of so many banks in 1855, California has been remarkably free from any general financial disturbances. Bad management has at times wrecked banks, but the cases have been individual, and the people have generally

had the good sense to discriminate between the sound and the unsound. The panic of 1893 spent its force in Los Angeles, where a number of perfectly sound banks were obliged to close their doors, and was hardly felt in the rest of the State. In San Francisco, the only banks to close were the Pacific Bank (an old institution that had fallen into incapable hands and was in such condition that liquidation was inevitable), and the People's Home Savings Bank, which was under the same management. Although many of the banks were drawn on heavily, more through the necessities of business than through alarm, they were all in good condition, and there was nothing approaching a panic.

State Supervision.

The constitution adopted in 1849 contained a stringent prohibition against corporations organized for "banking," the term being used as synonymous with issuing circulating notes. This was evidently the result of bitter experience with the "wild-cat" currency with which many of the states were afflicted. It was first assumed that this prohibition applied to all forms of banking conducted by corporations, and in 1850 the legislature passed an act putting into effect this interpretation; but a more careful examination of the organic law showed that the embargo was intended to extend to note-issuing corporations only. In 1862, the legislative prohibition was repealed, and many banks were incorporated under the general laws of the State. These banks were permitted to exist, but were neither encouraged by the State nor were they supervised in any way. In 1878 an act was passed creating a Board of Bank Commissioners, and thereafter all banks in the State, except the nationals, were placed under the control of the board. The provisions of the act were in the main good, and resulted in the correction of some loose practices. Amendments to the act were made from time to time, until in 1903 the legislature repealed it and abolished the commission. During an interval when there was no banking law in force, about eighty banks were incorporated under the general laws; but few of them have opened for business, the incorporators evidently believing that the charters so secured, with the freedom from restrictions, would become valuable. After an interval of some weeks, a new law was passed, which is in many respects an improvement on the former one. It provides for a board of four commissioners, at least one of whom must be an expert accountant. Every bank in the State (excepting the national banks) is required to apply to the commission for a license to transact business, and thereafter to report its condition in detail on past dates, three times a year. The commissioners are required to make at least one personal examination of every bank within their jurisdiction during the year. Banks found to be conducting their affairs in an unsafe or illegal manner may be ordered to conform to the law, and if they fail to comply are reported to the Attorney-General. When the commissioners are unanimously of the opinion that a bank is insolvent, they are required to take charge, and at the same time report the case to the

Attorney-General. That officer begins an action in the proper court, which, after a hearing, can either allow the bank to resume, or place it in the hands of a receiver. In case of the appointment of a receiver, the commission has general supervision over him and the liquidation of the bank.

Conclusion. The development of banking in California has been briefly traced from its beginning to the opening of the twentieth century. In the main, it has been a natural growth, following the needs of the different communities, and responding closely to their demands. One feature which is worthy of attention, is the fact that the banking capital which has aided much in the development of the State has been, in a great measure, produced in the State. At first, it came straight from the mines, and it is still coming in a steady stream from that source. Later, wheat, wool, wine, lumber and other varied products of this most favored land contributed their share, and the commerce that centered around the bay of San Francisco contributed not a little. It is true, as we have seen, that foreign capital had a share in the building of San Francisco, and that Eastern money has done much for the country around Los Angeles, but taking the State as a whole, it still remains true that California money has founded and is maintaining California banks. It is also a fact that the banks have generally loaned their money at home, and have not succumbed to the temptations afforded by high rates on the New York Stock Exchange, or the alluring lists of the dealer in commercial paper.

It will be noticed that in proportion to population, the country south of Tehachapi has many more banks than the rest of the State, and the banks have many more depositors in proportion to their deposits. This, again, is the result of the influx of people from the East, who are used to paying their bills by check. The inhabitants of the northern counties have not entirely outgrown the buckskin-bag safe deposit, and a surprising number of mercantile transactions are still settled in coin. This furnishes a legitimate field for banking enterprise, and some of the newly organized banks are working it to good purpose.

The prosperity of the past five years has led to a great increase in the number of banks, and many are still being started. In most cases, the increase is justified by the increase in population, or else the new banks develop that field of unbanked money which exists in every community. It is a fact that the town with only one bank never gives that bank all its funds. A second bank draws out deposits that would not come to the first, and this principle holds good in the larger city as well. It is, however, a question if the demand has not been, for a time at least, supplied, and the investment of capital in this way can not be advised, except after a thorough examination of the conditions in any particular place.

Though still a young state, California has a number of banks that are nearing the half-century mark, and many that have passed the quarter. Those concerns that have weathered the storms, and

come through without disaster, find the established confidence to be their best asset. They are not confined to the larger cities, but are scattered all over the State, whose development they are steadily fostering, not with the methods of the boomer, not spectacularly, but quietly; encouraging saving, helping legitimate enterprises, and resolutely checking unwise speculation. In their hands, and in those of the newer banks which are following the trails they have broken, the finances of the State may be safely entrusted.

CALIFORNIA'S SCHOOLS.

By ROBERT FURLONG,
Chief of Department of Education.

A review of education in California during the years of her statehood presents a period of remarkable activity in school development.

From social conditions in which only a few unrelated schools were conducted at irregular intervals, to a condition in which organized society is maintaining throughout the State a system of well-equipped graded schools—a system ranking with the best in America—such is the record of the first half-century of California's state history. To this record, which has special reference to the educational system now maintained by the State, should be added an extensive system of parochial schools and also many private schools, denominational schools and academies found in the larger towns and cities.

This marked contrast between education at the beginning of state history and as it is today becomes more striking upon making a study of the agencies that have contributed to the change.

A brief statement of some leading circumstances in the transitional period of state history may aid to a better understanding of later progressive changes.

During the years of Spanish and of Mexican control the few widely separated schools of California were supported either by religious societies or by tuition fees from patrons. A system of free schools, such as was proposed soon after American occupation began, had never been practiced under the old regime. The organic law that came into effect with the admission of California into the Union provided for a general system of public education. Thus early was laid the broad and substantial basis upon which has been built a splendid educational superstructure.

Public School System.

It is the theory of our form of government that a fair degree of education is necessary to good citizenship. To that end provision is made by law for at least an elementary education for all children in the State, whether poor or rich, in country or in city. No community is so poor, none so remote, but that it may have a school, free from direct cost to itself, if it will organize for that purpose. Accepting this privilege, every settlement in the State has its own school building in which a school is maintained during eight to ten months in a year.

Revenue for the maintenance of these schools is drawn in part from the state school fund and in part from county school funds. The first named fund consists of moneys accruing from various sources, but chiefly from a uniform state school tax levied annually. This money may be used only in the payment of teachers' salaries.

The county school fund is raised by a direct tax levied annually upon all property values in a county. The rate varies in the different counties, but must be sufficient to raise a sum not less than $6 per census child. It may be used for general school purposes, including teachers' salaries and school libraries. Additional revenue for increasing the school facilities, or for building a school house in any community, may be raised by a direct tax on district property when a majority vote of district electors so decide, or by a bond tax when carried by two-thirds of the electors voting at a special election for the purpose. In the year 1902 the total revenue from the State for schools was $3,588,626; from county school tax, $2,538,000, and from city or district tax, $326,095. The total of all receipts for public school purposes in 1902 was $8,125,490.63.

The amount of school money raised for each person between five and seventeen years of age (census age) in 1902 was $21.72—a sum equaled in only three other states.

It is and has been the policy of the State to set a high standard of qualification for its teachers and to pay sufficient to secure the best talent.

Courses of Study and Classification.

Nearly every phase of education is found represented in California schools. "From the kindergarten to the university" is an expression often used as inclusive of the whole range of educational activity in the state system. Outside this range, and beyond it, are found schools for technical and professional study. Such schools, while not in exact alignment with the regular system, are invaluable for students who would specialize in some chosen study.

The public school system comprises an elementary course of eight years, a secondary or academic course of four years, and the higher education or college courses of the university.

Where a city or district so elects, a public kindergarten course of two years may precede the regular courses named. Kinder-

gartens flourish in all the leading cities and in some of the larger towns, but only a few places maintain them as part of the regular school system.

The elementary course, which admits children at six years of age, provides for four years in a primary school and four years in a grammar school. This course is usually divided into eight grades, corresponding with the number of years ordinarily taken to complete it. A ninth grade or year is sometimes added. In rural schools of one department a single teacher may have pupils of all the grades. This, however, does not often occur. Rural schools with one teacher are common throughout the State. Wherever the ranches are large the population is correspondingly small within a district's limits, in which case the one-department school serves every purpose. Such a school is accessible to every country home. It is in session from seven to ten months in the year. It is usually a good school, in which all of the ordinary English branches are taught by a competent teacher. A course of study prescribed by official authority is followed in it with nearly as much precision as in a graded school having many teachers.

In the smaller valleys where fruit orchards and vineyards support many homes in smaller area, schools of several class-rooms are necessary. Modern buildings, equipped with the latest devices for the health and comfort of pupils, are the central places of interest in such communities.

The elementary school of the city does not differ essentially from the rural school of the same class, already described. Differences in environment to some extent modify working conditions. A large attendance permits of finer classification, also an increased teaching force permits of closer supervision. Teachers have the same legal qualifications and the subjects taught are those named in the statutes for *all* elementary schools. The course of study is usually more elaborate, the terms are longer, and school buildings better, as a rule, in the city than in the country.

Supervising teachers of special subjects such as music, drawing, and manual training are employed in the larger cities to aid class teachers in their work. A board of education and a superintendent of schools direct all educational work in a county, also in a city.

The statutory studies for the several primary and grammar grades of the elementary schools are as follows, viz, "Reading, writing, orthography, arithmetic, geography, nature study; language and grammar, with special reference to composition; history of the United States and civil government; elements of physiology and hygiene, with special reference to the effects of alcohol and narcotics on the human system; music, drawing, elementary bookkeeping and humane education." The statute provides that instruction in some of the branches named may be given orally. Educational values are considered by school boards when making time allotment for different studies in a course. Each county and each city has a certain independence in having its own course of study, yet, since all courses must conform to

the statutes, the differences are not essential, being mainly matters of detail in method or suggestion.

The State has looked with special favor upon its elementary schools. By constitutional provision the state school fund, amounting to millions of dollars annually, can be used for no other purpose than for the payment of teachers of primary and grammar grades. This support, considered with the high standard required of teachers, places the elementary schools of California on a higher plane than is the same class of schools in perhaps any other state. And a school of this character is within reach of every home. Families contemplating a residence in California will find upon their arrival, no matter where they locate, a school in session in that neighborhood ready to enroll their children as pupils.

They will find that the flag has preceded them there, and that in California the school house "follows the flag"—its chief support—its supplement as the emblem of a free and enlightened people. The flag and the school are inseparable.

Secondary or High Schools.

A knowledge of the common English branches, even as taught in the best grammar schools, is no longer thought to be sufficient school equipment for the work of life. It is now nearly twenty years since the people of California began to realize this. Outside of the large cities there were then few high schools in the State. Today there are no cities, large towns or thickly populated sections of country without such schools. Those located in cities are commonly designated "city high schools," as they are supported chiefly by city revenues. The law permits two or more adjacent districts to unite in maintaining a "union high school." Many rural communities have taken advantage of this statute. Union high schools have multiplied of late years until there are now very few counties unrepresented in this class of schools. Primarily the union high school is intended for pupils who have completed the work of the grammar schools in the districts uniting. Cost of maintenance is provided mainly by a levy upon the property value of the union high school district. Some of the smaller counties maintain a county high school, usually at the county seat. A county high school fund meets the expense.

The three kinds of high schools named, while differing in organization and means of support, are essentially the same in plan and purpose. Nearly all high schools have a four years' course, which begins with the completion of the grammar school. Tuition is free in all. The course is academic, covering college entrance requirements.

Of the 143 high schools in the State, 118 are accredited to the State University at Berkeley, which means that the university has, after inspection, recognized these schools as doing the kind and amount of preparatory work necessary for admission to its colleges. Student graduates from such accredited schools, when recommended by their high school faculty, are admitted to the

university without examination. In addition to the preparatory course for college, some high schools have elective courses that do not contemplate later college study.

An advanced commercial course is a strong feature of some high schools of the State. Students taking such course usually enter active business life upon leaving school.

Polytechnic high schools are maintained in a few of the large cities. In these students are trained in the mechanical arts.

As already stated, these various secondary schools are sustained chiefly by local means. Each county, city or community having a high school bears the burdens of its own school. In this respect they differ from the elementary schools, which are supported by the people of the whole State. A recent amendment to the constitution permits the legislature to grant state aid to high schools. The first support of this kind given to secondary education was during the past year. It is believed that this state aid in the maintenance of high schools will give them a new impetus for growth and strength; that they will increase not only in numbers, but in efficiency also.

The State University. The crowning institution of the State's educational system is the University of California. This was chartered by the State in 1868. Five years later it was installed in its present home at Berkeley, overlooking San Francisco bay and some ten miles from the metropolis of the State. While the main site is at Berkeley, the University has affiliated colleges, various branch institutions and experiment stations elsewhere over the State. The vigorous growth it has made during the last decade has astonished the university world. Its comprehensive system of colleges and the facilities they offer for both cultural and vocational study; the work it is doing along certain lines of special investigation in science; the aid it is rendering to several leading industries of the State, are all matters too widely known to need review here. It is sufficient for the purposes of this article to point to the fact that this great institution of learning, with all the opportunities it offers to youth, is open, free from tuition, to every student of either sex who has made the necessary preparation for admission to its colleges.

Leland Stanford Junior University. Although not a part of the public educational system, this university opens its doors to students, without tuition, in all of its college courses. It, also, is ranked among the leading universities of the western world. It was founded by the late Senator Leland Stanford and his wife, Jane L. Stanford, as a memorial to their deceased son, for whom the university was named. It is located in the beautiful Santa Clara valley near the college town of Palo Alto, thirty-three miles from San Francisco. It is richly endowed. Its faculty is strong; its student body is select. Although young in years, this university has attained marked distinction. Throughout the civilized world today it is perhaps as well known as any university in the United States.

Private and Denominational.

It will be seen that California is not lacking in facilities for the higher education. Besides the two well-known universities described above there are numerous institutions of good standing that confer college degrees. These are mostly of a private or denominational character. Prominent in this class of institutions might be named Santa Clara College, University of the Pacific, University of Southern California, St. Mary's College, Pomona College, St. Ignatius College, Mills College, and others. From some of these colleges have come men and women of distinction in the history of the State and in the affairs of the nation.

Qualifications of Teachers.

In the state system of public education, and in general for all classes of educational institutions, the character and training of teachers receive careful attention. Few states in the Union have set such high standards of qualification for teachers as are established in California. The statutes name the requirements for the different grades of certificates which teachers must hold. To qualify as teacher in a high school requires both academic and professional knowledge of a high order. This means a full course in a university, which course must include pedagogical study.

State Normal Schools.

California has five professional training schools in which students may qualify as teachers for the elementary grades. These schools, maintained by the State, are located one each at San Jose, Los Angeles, Chico, San Diego and San Francisco. Their courses vary to fit different local conditions. At this time the normal schools at San Francisco and San Jose have the professional course of two years. The Chico and San Diego schools have a four years' course, which is academic and professional. The Los Angeles school has a course of two years and one of four years. Requirements for admission to the professional course are much higher than for the longer course that includes academic work. These normal schools are doing an excellent service for the State in furnishing trained teachers for its primary and grammar schools. Their value is becoming better recognized each year, as is evidenced by a steadily increasing demand for their graduates.

The limitations of this article have not permitted of more than a hasty glance at any of the several agencies named as factors of education in California. Only the means to an end have been presented. The various phases of class-room work, what the schools are actually doing for the youth of the State, what the people are receiving in return for the millions of dollars annually expended in education, are all topics that invite discussion, but they are outside the scope of this review. In this article the aim has been to show that California is well provided with educational facilities, that her schools of every grade are of as high standards as any in the Union, and that intending homeseekers will find in this Golden State all that they may desire in the education of their children.

MORAL AND RELIGIOUS LIFE IN CALIFORNIA.

By CHARLES R. BROWN,
Pastor of First Congregational Church, Oakland.

In all the years of human history men of moral vision have been going west. Many of them went out not knowing whither they went, sailing under sealed orders and unaware of the full significance of their action, but nevertheless moving forward in the definite fulfillment of a divine purpose.

It was in that spirit of faith that Abraham left Chaldea—he went out, he went west, to Canaan to rear his family in the worship of one God. Thus Paul went out—he, too, went west from Troas in Asia to Macedonia in Europe, that he might plant his gospel in the newer continent. Thus the Christian missionaries in the days of Augustine went out—they went west from Italy to England, when the latter country was pagan, that they might evangelize the people. Thus Christian men went west from Europe to become the early settlers in our own land, laying the foundations of the republic in faith and devotion. Thus Whitman and Benton, Junipero Serra and Thomas Starr King went out, going west to make known upon the Pacific Coast the message of divine love. And thus the shiploads of missionaries and school teachers still go, moving west, that in the Philippines and all the islands of the sea, as well as in China and Japan, they may sow the seed of a nobler life. It has been a long and unbroken procession, setting out from the older East to the newer West in the spirit of moral adventure.

A splendid share of this idealism went into the early life of California. We find all about us abundant evidence of the venture and heroism of faith. Spanish missionaries, following in the wake of the conquest by Cortes, crossed over to Mexico, and then finding their way up through Lower California, planted their preaching stations in all the valleys that lie along the sea. San Diego and San Gabriel, Santa Barbara and San Luis Obispo, Monterey, San Jose, and San Francisco—these are the enduring monuments of their early efforts; and they went still farther on until they reached Sonoma, where the movement paused. They taught the Indians to think and to work and to pray. They practiced a beautiful, uncalculating hospitality. They gave character to that mission architecture which is a distinctive feature of the State.

And in those early times another world power, Russia, sent hither its missionaries, representing the Greek church. They came, not from the South or from sunny Spain, but from the frozen regions of the North, crossing at Behring's strait, planting the standards of their faith in Alaska and continuing as far

south as Fort Ross, which stands also in Sonoma county. And even as the "Sans" and "Santas" of Southern California testify to the work of the Spanish missionaries from the Latin church; even as the names of "Alhambra" and "Alviso," "Alvarado" and "Alameda," point back still farther to the time when the Moors crossed into Spain, bringing the Arabic "Al" with them, to be carried in turn by those Spaniards to the New World; so the names yonder in Sonoma county, "Russian River" and "Sebastopol," "St. Helena" and all the rest, speak of the presence of Russian missionaries from the Greek church.

But into the moral life of this mighty State God meant that Saxon ideals and Protestant principles should also enter. Across the plains and around the Horn came a great company of devoted men and women to found schools and build churches which should minister in still other ways to the higher life of this rapidly growing commonwealth. We find, therefore, today, as a result of these varied efforts, all the well-known religious bodies well represented in California by able ministers and prosperous churches, which furnish moral leadership to the communities where they stand.

There has been a mistaken impression in certain quarters that moral conditions in California in the days of the pioneers were especially wild and lawless. The country was new, indeed, and the discovery of gold brought adventurers as well as sturdy and useful types of American life. The atmosphere was one to develop that courage and self-reliance which sometimes forget the respect due to order and system. In some of the early settlements and mining camps it was, indeed, as in the days of the Judges: "In those days there was no king in Israel; every man did that which was right in his own eyes." The trip across the plains or the voyage " 'Round the Horn" had prompted the spirit of self-reliance until all hands were ready to face difficulty and danger with a jolly good humor which sometimes bordered on recklessness.

But after all the necessary admissions are made, the moral sentiment of the dominant element among the pioneers was just and true. In the days when, owing to the preoccupation of the men of force and influence in rapid money-making, the administration of affairs at San Francisco had become too feeble and corrupt to be endured, there came the Vigilance Committee. It was in its personnel and in its methods of procedure as far removed as could be from the spirit of the mob. They were grave, determined men who saw that necessity was upon them to rebuke defiant wickedness in a way that could not be misunderstood, and to rid the community of a set of scoundrels which were a menace to all decency and honesty. The real leaders of the Vigilance Committee were, indeed, public surgeons, and they cut away with care and insight the cancerous growths which threatened the life of the body politic. The result was that there came a clearing of the air, a strengthening of the moral sanctions and an increase of that better sentiment which is for the health and security of any community.

There are certain characteristics of the moral life of the State

which are noticed at once by those who come to make their homes in California. The generosity of the people is warm and abundant. The spirit of those days when men gave freely and even recklessly because they were digging gold out of the foothills by the hatful, has been handed down to their successors. The people now respond readily and largely to the appeals of genuinely good causes.

The evidence of this spirit is apparent in the various sections of the State. The generous thoughtfulness of one family alone on behalf of higher education for the youth of California and of the Greater West has given more than thirty millions of dollars for the rearing and endowing of Stanford University. When his son died and left him childless, Senator Stanford said, "The children of California shall be my children," and the millions were placed where they would bless and enrich the lives of all the generations of aspiring young men and young women yet to come. In similar spirit James Lick devoted his great fortune to the creation of the Lick School of Applied Arts, of the famous Lick Observatory on Mount Hamilton, where the clear skies of California give astronomers an almost unbroken opportunity for the study of the heavens, and of other well-known institutions which owe their existence to his generosity.

The gift of other fortunes less notable, perhaps, but given in the same spirit of unselfishness, has reared for the people of the State a splendid array of hospitals and homes, galleries and libraries, schools and churches. In all the lines of activity which call for generosity and public spirit there are a great company of citizens here who have learned that "it is more blessed to give than to receive."

The moral life of the State is also characterized by the spirit of freedom and tolerance. The members of religious bodies which observe as their sacred day another day in the week than that observed by the great majority of worshiping people find in California no statutes compelling action which their conscience does not approve and no legal prohibitions interfering with what is to them the pathway of duty. The aim of California has been to "render unto Cæsar those things which are Cæsar's" by legislating only in regard to those secular interests in which all stand alike before the law, and to leave to the free and untrammeled decision of the individual conscience those deeper, personal attitudes and relationships "which are God's."

This absence of the puritanical habit of mind has sometimes been misinterpreted. The strong, natural, adventurous men who always rally on the frontiers are ever impatient of restraint—sometimes impatient of wholesome restraint. The outdoorness of our life; the fact that over wide areas people may, if they choose, go off upon picnics fifty-two Sundays in the year; has added to this spirit of freedom which may indeed be carried to excess. This manifest geniality of the climate and the inviting nature of the outdoor air have therefore had something to do with an irrespon-

sible habit of mind. It is much easier to believe in the wrath of God against evil in Northampton than in Pasadena, especially in the winter months. The absence of some of the rigors and terrors that have found place in the habits of mind belonging to serious people in other regions has not always been to our advantage.

But even as religious people have found upon the whole that a separation of church and state, and the consequent commitment of all religious interests to the care of voluntary loyalty, have been for the advantage of both church and state, promoting a more resolute and less formal type of piety, so the air of freedom and the less conventional atmosphere touching matters of ethics and religion in California have meant the development of a large class of men who, left to themselves, chose righteousness simply because it was right. The children of any republic must in the long run learn to be free without abusing their freedom; and in this large confidence that virtue will in the long run furnish its own effective sanctions California has sought to build her moral life. "She has shown her faith in the power of noble ideas by simply setting before them an open door."

The religious life of the State is characterized as well by its missionary zeal. The churches which are here are the results of missionary gifts and enterprise on the part of others in the early history of the land, and the heirs of this gracious legacy are resolved to hand on the inheritance, not diminished, but increased. The readiness of the various congregations to respond to appeals for contributions to advance religious work in the lumber camps and mining towns, in the lonely villages and the sparsely settled regions, is proverbial. The mountains and the arid regions which cut us off from immediate contact with the rest of the country but serve to strengthen the feeling of fellowship and brotherhood among Californians; and the interest of the cities in the country, of the older communities in the newer, promotes this warm and sympathetic missionary interest which aids steadily in the furtherance of righteousness.

The situation of California, fronting on the Pacific and looking across toward great populations yet to be inspired by higher ideals than those furnished by their own ruder faiths, acts also as a stimulus to foreign missionary enterprise. The prevailing sentiment is that the whole Pacific Coast has come to a sublime period in its history. The oldest homes of civilization were inland. In the valleys of the Euphrates and of the Nile the children of men built their early cities, planting their homes along the great rivers. But as the strength and the ambition of the race were enlarged the seats of civilization were transferred to the greater body of water, when Tyre and Corinth, Rome and Constantinople, became the nerve centers of the world's enlarging life around the Mediterranean. But civilization grew apace until it removed to the borders of the still greater Atlantic—London and Liverpool, Hamburg and New York, became centers of influence and power. But today, as never before, the interest of the world is upon and

around that greatest of all the oceans, and wise men in the political and commercial councils of the world are saying that the Pacific will be the future theater of the world's most important events. It becomes, therefore, of vital importance that our nation should face that ocean with the spiritual frontage of a robust, intelligent and devoted religious life. This obligation is deeply felt and it is being met in a generous expression of missionary interest on the part of all the religious bodies in California.

The presence of such a large proportion of men in all the churches is remarked at once by those who visit California. David Starr Jordan of Stanford University has called California "one of earth's male lands," accepting Browning's designation of certain regions which call peremptorily for the masculine virtues. "The first Saxon settlers," he says, "were men, and in their rude civilization women had no part. For years women in California were objects of curiosity or of chivalry, disturbing rather than cementing influences in society. Even yet California is essentially a man's state. What we commonly call public opinion—the cut-and-dried decision on social and civic questions—is made up in the house. It is essentially feminine in its origin, the opinion of the home circle as to how men should behave. In California there is little of this convention and tradition, for speaking broadly, in California the virtues of life spring from within and are not prescribed from without. In short, California is a man's land, with male standards of action—a land where one must give and take, stand or fall, as a man."

The very predominance of the masculine element in the life of this younger of the states in the Republic has done much to emphasize the responsibility of the man in matters of religion. There is among us a smaller percentage of men who hold their religion in their wives' names. The mother of Zebedee's children is less often compelled to go alone to offer petitions and prayers on behalf of her sons while Zebedee is away fishing. The presence of this large number of men in the various congregations of the State tends to make the preaching direct and practical; it aids in keeping religion free from unwholesome mysticism or empty sentiment.

The presence of a larger percentage of criminals than is found in some of the older states is sometimes cited to California's disadvantage. If we had only the criminals of our own raising we would be ready to stand comparison with the best states of the Union. But, as all students of sociology know, the criminals, the tramps, the ne'er-do-wells of other states are constantly fleeing to the West to escape detection or in the hope of finding an easier field for exploitation. They move on until they reach the Pacific Ocean, and then, unable either to cross it or to effect a return to the abandoned fields in the East, they heap up like drifting sand and dirt upon our borders. The accumulation, therefore, of those who have gone West, not to grow up with the country, but to escape disaster which they had brought upon themselves in other

states, accounts in large degree for the greater proportion of the criminal element on the western border of our country.

It would not be of general interest to give here tabulated statistics touching the value of church property in California, the number of communicants, the wide range of benevolent activity to be found in all the religious bodies. If space permitted the introduction of such figures, California would make a splendid showing. The growing appreciation on the part of the people as a whole touching the wholesome moral influence exerted and the humane service rendered by the churches is indicated by the fact that four years ago the people, by a handsome majority, adopted an amendment to the constitution exempting from taxation all church property used exclusively for religious worship, thus bringing California into line with the other states of the Union. The influence of this action is seen already in the erection of more permanent, costly and beautiful structures as places of worship in all the cities of the State.

It might seem invidious to name any and not name all the religious organizations at work in California, but certain facts seem especially worthy of notice. Some of the largest and best appointed schools and convents, hospitals and homes of the Roman Catholic Church in America are to be found in California, for, from the days of the Spanish grants to the early missionaries of that faith, this church has enjoyed great prosperity. The fourth largest Congregational church in the United States is located in Oakland, California, and one of the largest Presbyterian churches in the country is in Los Angeles. One of the stateliest and most ornate church buildings in America is that of the Memorial Church at Stanford University. The maintenance of their historic forms of worship in the well-appointed synagogues of all the larger cities and the kindly service of their well-organized and far-reaching charities, testify alike to the prosperity of the many Hebrew congregations. The noble traditions of the Episcopal Church, the glowing zeal of the Methodists, the missionary earnestness of the Baptists, the robust faith of the Lutherans, the evangelistic activity of the Christians, as well as the characteristic notes of religious life in the many other bodies at work within the State, all find expression in the flourishing societies which bear these various names and labor together in loyal harmony for the triumph of righteousness and peace in a land beautiful in climate and situation, and growing daily more beautiful in its deeper, inner life.

The splendid showing made by the religious forces of this commonwealth is the more remarkable when one reflects upon the fact that California is essentially a new country. We need only turn back fifty years to find a situation just beginning to be touched by those forces which make for the permanent prosperity and well-being of any state. If one should stand with uncovered head at Plymouth Rock in the old commonwealth of Massachusetts, or reverently tread the soil of Jamestown, Virginia, the story of

California's briefer life would seem like a watch in the night or as yesterday when it is past. The paint and the varnish are scarcely dry on much of the work which contributes to the welfare of a people.

Yet religion is naturally a plant of slow growth; it is one of the conservative forces of society and does not leap into its full strength in a night as do some of its rival influences. Its gentler virtues do not thrive in the bustling atmosphere of a gold excitement or a real-estate boom. It accomplishes its work best where it quietly becomes incorporated in the institutions and habits, in the sentiments and affections of a people, and thus comes to its own appointed fruitage in a nobler, purer and more humane life. All this requires time; and religion has not yet come fully into its own here in California, because of the brief period covered by the history of the State.

The Lord of all the values there are began a long time ago, even before the building of Solomon's Temple, in order that He might have the great sequoias of the Sierra ready for our coming. In the far distant past He sowed the seeds of those splendid forests which adorn the hillsides in Mariposa and Calaveras. In similar fashion, the many people now intent upon the higher life of California are today sowing in fidelity and love the seeds of that mature, well-developed and effective Christian civilization which in spirit and moral quality shall match the glorious climate and the wonderful resources of this fair State. And this noble result shall not be alone for our security and well-being—it will be for the healing of the nations. The gateway of the West is a "Golden Gate"—through it comes in the commerce from the Orient that shall make the nation rich, and out of it shall go those wholesome influences which, as missionaries of the Lord, are to enrich the lands beyond the sea with values that perish not.

THE OUTDOOR LIFE OF CALIFORNIA.

By WILLIAM GREER HARRISON,
President of San Francisco Olympic Club.

We live in our lungs; therefore, anything that improves our abode is of importance. The question naturally arises, "What is the best method of increasing lung power?" The answer is, "Deep breathing of pure air." In other words, the continuous exercise of the lungs in inhaling clean air and exhaling impure air. Exercise in the open is the way of enlarging the breathing capacity of the lungs.

Throughout California the conditions of climate are such that lung exercise may be indulged in at all times without risk to any organ. The temperature of the lungs is never oppressive; no blizzards, no cutting winds, no stabbing of the lungs by frozen air: a genial, balmy, yet exhilarating atmosphere everywhere. San Francisco has a mean temperature of 65 degrees. The temperature throughout the State makes a mean of about 60 degrees. In the interior the air is so dry that at a summer temperature of 100 degrees, outdoor sports, tramps and mountain climbing are as freely indulged in as in the autumn. In mid-winter, outdoor amusements, such as long-distance tramps, shooting, fishing, and swimming, are enthusiastically pursued. On Christmas day of 1903, and on New Year's day of 1904, the writer led some seventy-five members of the Olympic Club over a fifteen-mile tramp right into the Pacific Ocean, where the party breasted the breakers, played leapfrog on the shore, and gamboled and scampered like lads of ten, and not a man caught cold. All over California there is in the air an electrical stimulant which is most bracing and which does away with that tired feeling so common elsewhere.

Then we have the pines, the aroma from which is almost an intoxicant and is the most subtle and effective of lung tonics.

We have the redwoods; giants, grand, stately towers in the forest. The exhalation from these acts upon the lungs as a light massage and emollient.

We have rivers and mountains, lakes and valleys, not exceeded in natural beauty anywhere.

We have pine-clad and brush-clad hills to clamber through, which is a joy without limit. The pleasure in hill-climbing is increased always by the beauty of the landscape, the rivers or the ocean, with islands, points, promontories and straits which fill the eye everywhere and yield a sense of enjoyment found only in the use of the eye and the muscles.

California is a land of brown shadows and blue skies—the brown of the hillside, the blue of the ocean and its reflection in the sky, produce unpainted pictures in lavish abundance. Wild flowers—unwritten poems—greet you everywhere. Waterfalls, the joy tears of the mountain sprites; cascades, in whose music you hear the weeping of wood nymphs over dead forest kings. The bubbling, babbling brooks, interpreting the song of their silver-coated citizens; the cooing of the dove, the whir of the quail, the whiz of the snipe, the honking of the wild goose, and the frou-frou of the duck—all these are for the man who loves nature and desires to be at home with her, and are common everywhere in California.

Here the sportsman finds his paradise, and here are—

Birds: Mountain and valley quail, English jacksnipe, wild pigeon, blue grouse, sage hen, robin (big, full-bodied birds), meadow lark, curlew, black ibis, billhead plover, vacet, willet (snipe), king rail, Virginian rail, reed bird, robin snipe, sandpiper.

Ducks: Widgeon, teal, sprig, gadwell, canvasback, redhead, butterball, ruddy, blue-bill, Mexican tree duck, brownhead or whistler, mallard, spoonbill.

Big game: Brown or cinnamon bear, black bear, elk, mule deer, blacktail deer, silver-gray fox, red fox, California lion (puma).

Small game: Gray squirrel, pine squirrel; rabbit—cottontail, brush and hare; beaver and ground-hog.

Fish: Salmon—landlocked, quinnat, blueback, hookbill; trout—rainbow, cut-throat, red speckled, brook, Loch Levin, Von Behr; rock cod—blue and red; flounders, tomcod, smelt, halibut, barracuda, striped bass; perch—redtail, surf and big-eye; sole, white bait, pompano (butterfish), sturgeon, shad, anchovies, sardines.

Fish, birds, big game and small game can be reached easily by short-rail routes; and then comes the true pleasure of the sport—

SURF-BATHING IN PACIFIC OCEAN, NEAR CLIFF HOUSE, SAN FRANCISCO—NEW YEAR'S DAY, 1904.

the climbing, clambering, tramping; the oxidation of the lungs and muscles; the joy, the pure physical joy, of movement; the luxury that follows the overcoming of difficulties; the scramble over big rocks; the climb over hills carpeted with pine needles, and the enthralling sense of victory when the objective point is reached.

Alone in the woods—alone with God! Alone on the mountain top, you are reverent and prayerful, but never sad or depressed. Breathing in the pure mountain air, you breath in hope, inspiration, and you would commune with the Master of the World, and rejoice that you live and move and find harmony in your heart. You can throw your cap peakward and shout like the schoolboy out for his holiday; for you have drawn away from and mounted

high above the pettiness of the lesser life. You have shuffled off the business coil which bound you to your desk; you are free, and the thought of freedom is yours; and you are buoyant and gleeful and in love with all the world.

California is the home of the artist; indeed, California is another Italy, and a new Virgil would write the Bucolics and Georgics as of and about the Italia of the Pacific. Virgilian description of the old Italy exactly fits the newer and richer state. But we have color effects here not known, I think, even in Italy. Take the hills overlooking San Francisco—Marin hills—and you have a bronze-brown effect in color that is tantalizingly beautiful, because you want to catch and hold it as a something too exquisite to be left to itself. You have an infinite variety of shadings to this weird brown; indeed, there is a kaleidoscopic change, from second to second, which is literally fascinating.

Then our sunsets; in them there is a supreme beauty, since all colors, all shades—dazzling, rioting, perplexing—mingle with or are a part of the rays which glorify the sky, the hills, the valleys, the seas, the ocean, with a light that is as the smile of the Eternal. Here is the place in which to *breathe* the sunshine. Light and colors are inhaled, and it is time some one explained the beneficent effect of the inhalation on the blood and brain and moral nature of man. California is the solarium of the world. When the sun throws aside the robes of night and breathes his morning benediction, until his evening prayer, when his lingering blessing touches everything with his kiss, there is a golden dusk or a sun-charged atmosphere in which man may drink a newer, richer draught of life.

And the ocean, the Pacific; never monotonously peaceful; just a vast champagne bath, a universal salt glow, where massage is free to all the world. Always open, never a bar to ingress; no ice, no snow; a storm only momentary and joyous excitement. The roar of the breakers an organ peal, the swell a flowing song, the spume an electric bath. Summer or winter, never a day when you can not safely enter the Pacific, plunging and swimming, breasting breakers or high waves, with a feeling of victorious pleasure and a sense of fitness that is a promise of eternal youth.

From San Francisco to San Diego and thence to Catalina Island there are bays, inlets, roadsteads, where foaming steeds, white horses of the sea, rush madly to the shore. Here the strong swimmer finds joy inexpressible. Dashing under the swirling breakers he floats triumphantly for a moment in the long hollows of the ocean, and then with an increasing vigor again and again evades the rush of waters and with practiced arms steers his way to the sea incarnadine that lies like another sky beyond the breakers. Here, summer or winter, he flings aside the resisting waters and heads oceanward—a long, steady pressure, an overhead stroke or a side stroke carries him far from view, until presently he turns shoreward with rapid strokes when he once more margins the breakers. These he uses like a circus rider, and mounts

horse after horse until he is once more on the shore lines. The strength of it, the joy of it, only the swimmer can feel.

And all this in winter as safely as in summer. Indeed, it is absurd to talk of winter in the Golden State. All days are open to the athlete and his pleasures.

If you tire of the old ocean, then turn your eyes lakeward. Tahoe sits in the Sierra like a great golden-gray bowl, full of limpid water teeming with silver-coated trout; guarded by mountain ranges so weird in form and in color that one naturally looks for the gnomes, elfs, goblins, which have, or ought to have, their homes in the curious crevices, caverns, brakes, peaks, domes, curves, and bends which make of Mount Tallac and his kin a giant's causeway

A SWIMMING PARTY AT ALAMEDA—CHRISTMAS DAY, 1903.

leading to a land of delight. Tahoe is 6,000 feet above the sea level; Mount Tallac is 3,000-odd feet above the lake, and from its rugged peak you look down upon a score of lakes set like precious gems in a setting of emerald green. The tramp to Tallac's gray top is just rough enough to give an added interest; it is a stiff climb, but when the peak is under your feet you forget everything except the glory and the joy of the vista.

You tire of the lake scenery? Then off to the McCloud river for trout, or to Monterey bay for salmon trolling, or the Sacramento for perch and salmon. Oh, I could name you hundreds of places in which to be glad that God made you!

Once a year, usually in the month of August, members of the Bohemian Club of San Francisco shake the city dust from their

feet and for three weeks make their home in the heart of a redwood forest. "'Neath the green sentinels, whose feathery plumes sweep the patines of Heaven," they pitch their tents and abandon themselves to a life that is in harmony with Nature. The fisherman fishes and the pedestrian makes his ten or fifteen miles daily, whilst others lie prone on the bosom of Mother Earth, breathing in the forest air with a sense of pure enjoyment. The singer and the story-teller weave fancies that find expression in music and literature and painting. Others group themselves in nooks and hollows and wonder what the record of the giant trees would read like if only Nature enabled them to reveal their knowledge. These trees were above ground long before the Babylonian empire fell. They were lofty pillars of the forest when Joseph went down into Egypt, and they were probably full grown when Christ was taken by another Joseph to the land of Pharaohs. Europe was the home of barbarous tribes when these felt their full growth; and civilization after civilization appeared, fulfilled its destiny and was succeeded by new thoughts, new purposes, these to make room for the dominant purpose of today. Yet these trees lived and breathed ere England or America had a name or a place upon the map of the world.

California is the only country in the world, I think, where midsummer is entirely free of rain and where it would be possible to spend three or four weeks absolutely in the open.

Polo, football, baseball and tennis are playable all the year through; and golf, lacrosse and cricket are only temporarily retarded by the degree of wet in the soil after our annual shower bath. Thousands of our young lads and lasses pay no attention to rain, but pursue their walks in wet weather as in dry. Indeed, few outdoor pursuits are affected by our wet season. We have usually three or four days' rain, followed by a fortnight of the most delightful weather—clear, bright, sunful days when one rejoices in life.

In the bay counties we have sea fogs, which are of infinite service to all growing things, and are to many a source of pleasure in their effect upon the skin.

But the great charm of California is that always and everywhere you can live in the open, except in the brief interval when rain is most abundant.

Fullness of days, rather than length, is the desideratum. A weak man is a travesty on Nature. Better fifty years of strenuous, full life than one hundred years of vegetable existence. But in California long life and full days go together. In the free, open life of the Golden State there is no excuse for lack of health; only the inherently indolent suffer. All who accept the treasures of the air, the sea, the forest, and the ocean as their own put on the full garb of man and woman and live such a full life as can be lived only in California.

The joy of living; the rapid-coursing, life-making blood; the clean, full lungs; the buoyancy of youth in middle-aged man—these are ours, and we thank God for life!

CALIFORNIA'S HEALTH RESORTS.

By A. J. WELLS.

For the healing of the "ills to which flesh is heir," California has over two hundred mineral springs of known excellence, and health resorts too numerous to be here even catalogued. They are distributed over the whole State, and under climatic conditions so beneficent and so general as to make the State itself a health resort.

The Climate.

The serene skies and atmospheric peace; the absence of "winter and rough weather"; the dry air of the cloudless summers; the breath of pine forests that are never damp, and the salt air of a sea whose habit is not stormy, have made California a Land of Health. No other country in the world with such range of latitude can show such climatic unity. There is a sea climate and a land climate, but save as modified by nearness to the ocean or by elevation in the mountains, the climate of the State is one. Lines of latitude hardly count. Oranges ripen in the upper Sacramento valley as finely as in the groves of San Diego, 600 miles south; and the summer sojourner about Lake Tahoe or Mount Shasta finds the same temperature that he would find at a like elevation in the mountains of Southern California.

And not even the countries which border the Mediterranean, where the same physical causes operate to produce a genial air, can show winters so mild, or summers so dry, or so free from cold and irritating or hot and enervating winds, as in California. Winter shows a green world, and makes all the land save in the high mountains a miracle of color. There are rainy days and days of storm, but there are weeks of sunshine, and sunshine when it comes is not an intermittent escape from objecting clouds. The skies are blue, the atmosphere cleansed and all the air radiant, equable, hygienic, rejuvenating. Summer is everywhere dry, and though in the interior it may be hot at noon, the absence of moisture produces a rapid evaporation, reduces bodily temperature, and makes sunstroke a thing unknown. Then, too, the dry atmosphere provides for rapid radiation from the surface of the earth at night, quickly dissipates the heat of the day, and insures cool and refreshing hours for sleep.

Mineral Springs.

Now, it is in such a setting as this that the mineral springs are found. For the most part they are in the foothills, in the driest and finest air, where the only dampness discoverable is in the bathtub, and where no breath of malaria ever comes. From the first of May to the middle of October no rain falls, no storms blow, no changes of weather occur. A hundred localities during this season are like

that place in Persia where it is said they have no weather, so like each other are the days and weeks as to excite no comment.

Mineral springs in California, as elsewhere in the world, are classified as alkaline, saline, sulphur and iron, and many of them are as valuable as any in Europe. A study of authorities on this subject shows that nature has widely distributed the elements which enter into the composition of mineral waters, and that therefore many California springs are almost identical in composition with famous European springs. Thus Aetna Springs, in Napa county, California, shows sufficient similarity with the noted Ems water of Germany to warrant like physiological and therapeutical action. Compare the following tables:

ÆTNA SPRINGS, CALIFORNIA.

Alkaline water. Temperature, 98° F.

Mineral Ingredients.	Grains per U. S. Gallon.
Sodium chloride	29
Sodium carbonate	75
Sodium sulphate	8
Potassium sulphate	trace
Magnesium carbonate	14
Calcium carbonate	10
Ferrous carbonate	trace
Silica	trace
Total solids	136
Carbonic acid gas (cubic inches)	58

EMS, GERMANY.

Alkaline water. Temperature, 115° F.

Mineral Ingredients.	Grains per U. S. Gallon.
Sodium chloride	62
Sodium carbonate	84
Sodium sulphate	trace
Potassium sulphate	3
Magnesium carbonate	7
Calcium carbonate	10
Ferrous carbonate	trace
Silica	3
Total solids	169
Carbonic acid gas (cubic inches)	59

So also the Santa Ysabel Warm Sulphur Springs on the coast line of the Southern Pacific Railroad, nearly midway between San Francisco and Los Angeles, are shown by Dr. Winslow Anderson to be very similar to the famous Arkansas Springs at Little Rock, Arkansas. The waters are tonic, antacid, diuretic, aperient and alterative, and while not advertised, or used as a resort, the springs have for centuries been used by the Indians, and later by the Mexicans and the Mission Fathers.

Not far away are the El Paso de Robles Hot Springs. These are among the best known in the State, and are amply provided for the entertainment of guests, having a great hotel and magnificent bath house. The waters of the springs are sulphurous and alkaline, and vary in temperature from 59 degrees to 104 and 122 degrees Fahrenheit. There is a white sulphur spring, an iron or chalybeate spring, a mud spring, a soda spring and an alkalo-sulphurous spring. These waters are specially serviceable in acute and chronic rheumatism, in blood, glandular and cutaneous affections, in kidney and bladder irritations, in catarrhal and other troubles of the mucous membrane. The mud baths for rheumatic affections are probably as good as any in the world, and will be increasingly resorted to as they become known. The iron spring is valuable in cases of anemia, chronic malarial poisoning, and the many diseases requiring an iron tonic. The situation is charming, on the coast line of the Southern Pacific Railroad, about sixteen miles from the ocean, immediately at the town of Paso Robles.

Shasta Springs.
Hotel Del Monte.

Byron Hot Springs.
Bartlett Springs.

FAMOUS HEALTH RESORTS.

and in a beautiful oak-dotted landscape. Climatically the region is wholly delightful.

The Gilroy Hot Springs are in the Santa Clara mountains near Gilroy, and have more than a local celebrity. For skin eruptions, scrofulous and glandular swellings, syphilitic and rheumatic affections, the water is used internally and for baths with great success.

The Tassajara Springs, in Monterey county, are hot, saline and sulphurous, and are used locally.

The Paraiso Hot Springs are also in Monterey county, and are widely known. The elevation is about 1,400 feet, and the air dry and pure. The springs are sulphur, soda and iron. The chief carbonated spring is called the "Carlsbad of America," and is found by analysis to be very similar to the noted Carlsbad of Austria. It is said to be of great value in gouty affections, rheumatism, liver and kidney troubles, and chronic skin diseases.

Pacific Congress Springs are in Santa Clara county, not far from San Jose. The waters are of the alkalo-chalybeate class, good for the anemic and dyspeptic, and are prized for table use. They are locally popular. The waters are similar to the noted Congress Springs of Saratoga, New York.

The Santa Barbara Hot Springs and the Montecito Hot Springs are five and six miles from Santa Barbara, in the Santa Ynez mountains. They are valuable carbonated and sulphur waters, antacid and helpful in dyspepsia and acid conditions of blood and urine, in gouty affections, Bright's disease and troubles of the liver. The waters resemble the Hot Springs in Arkansas.

The Matilija Hot Springs are much resorted to in Ventura county, are finely situated, and in a delightful climate.

The Arrowhead Hot Springs, near San Bernardino, are called calcic, or earthy. They have a local celebrity and are of undoubted value.

The San Juan Capistrano Springs are near the coast, and are locally well known.

The Coronado Springs are on the finger of land upon which the great hotel is builded, on San Diego bay, and are said to compare favorably with the Bethesda Spring of Waukesha, Wisconsin. The waters are called aperient, diuretic and tonic.

The Tia Juana Hot Springs are just across the line in Lower California, but are tributary to San Diego.

Carlsbad, north of San Diego, is similar to the celebrated Carlsbad Springs of Germany and the Kissingen Springs of Bohemia. The Temecula Hot Springs are the most noted in San Diego county.

Byron Hot Springs are in the San Joaquin valley, or rather in a small valley leading from the larger one. They are in Contra Costa county, not far from Mount Diablo, on the railroad line from San Francisco to Stockton via Martinez. The time is about three hours from San Francisco. What is known as the "liver and kidney spring" is strongly charged with sodium chloride,

and is called "heavy saline" by the chemists. It is diuretic and slightly laxative. The hot mud spring, the hot salt spring, the black sulphur spring, the white sulphur spring, and the iron and alkaline and chalybeate water are all used at this resort for various ills, either internally or as baths. The "iron spring" is a well-known remedy for fever and ague and malarial chills, and has been used by invalids for many years.

Bartlett Springs, in Lake county, were discovered in 1856, and have maintained their early reputation, and thousands have been benefited or wholly cured by the use of the waters. Rheumatic and chronic malarial affections, diseases of the liver and kidneys, dyspepsia, eczema, etc., are relieved or wholly cured. The springs are charged with carbonic anhydride, and are pleasant, sparkling, carbonated waters. They are called diuretic, laxative and alterative in their effects.

Equally well known are the Anderson Springs, also in Lake county. The springs are easily accessible, either from Calistoga or from Cloverdale, and the climate is unexcelled by any place in the world. One could live out of doors without tent or shelter from April to October. There are nine principal springs, hot, cold, salino-sulphuretted, alkalo-sulphuretted, salino-acidulous. They are widely popular, and have been used by many thousands with great satisfaction.

Other well-known springs in Lake county are Adams, Allen, Harbin, Highland, Howard, Seigler, Saratoga and Witters. These are all celebrated beyond their immediate locality, and are largely patronized year after year. Lake county is called the "Switzerland of America." Its scenery is attractive, and its climate unsurpassed by any other portion of the State.

In Napa county are soda springs known abroad, the water being widely distributed. The situation of the Napa Springs is charming, and the buildings commodious and impressive. The White Sulphur Springs are also in Napa county, near St. Helena, and the Calistoga Mineral Springs at the town of the same name.

Sonoma county has the celebrated "Geysers"—a marvelous region, full of steam and sulphurous vapors and uncanny noises, the fumaroles of a volcanic district. The springs are "iron," "alum," "acid," "salino-sulphurous," and "salino-boric-sulphurous," and are used both internally and for bathing. They are largely patronized, and are among the most valuable in any country. Mark West Springs, Lytton Seltzer and Soda Springs, Santa Rosa White Sulphur Springs and Skaggs Springs are in Sonoma county, and are well known throughout the State for their curative qualities.

Tehama has the Tuscan or Lick Springs, "Red," "White" and "Black," which resemble the famous Blue Lick Springs of Kentucky.

The Vichy in Mendocino county ranks among the finest on the coast, being in action and chemical composition almost identical with "Ems on the Lahn," Germany.

Shasta Soda Springs, near Mount Shasta, are much prized. The

trains of the Southern Pacific stop at the great springs, and the whole region is a well-known resort.

The Wilbur Springs in Colusa county are deservedly popular, as are the Klamath Hot Springs in Siskiyou county, while other sections of the State have medicinal springs that are more or less locally resorted to for physical benefit.

Resorts. These cover the State, and are of two classes, the mountains and the seaside. They embrace hotels of the highest grade, and outdoor camps. Coronado is in the extreme south, and unsurpassed on any coast for climate and comfort. Santa Catalina is an island in a summer sea, and one of the most delightful places in the world for rest and recreation. Long Beach, Redondo, San Pedro, Santa Monica, Pasadena, Redlands, Riverside, and Los Angeles itself, are both summer and winter resorts, where, if the season be wisely chosen, we are not oppressed by heat or beleaguered by storms. The San Bernardino mountains are much frequented in summer, and have a delightful air.

Southern California as a whole, along its placid ocean front or in its dry and balsamic mountain air, is what "Baedeker" says of it, "perhaps the most delightful climate in the world. * * * More salubrious general conditions can nowhere be found." This applies to both winter and summer, if one chooses, with ordinary sagacity, localities to suit the calendar. A kind of "lotus land" it is, where, after tarrying a year or two, one loses all desire to return to the land of greater rigors. The growth of its towns and cities is a tribute to the climatic peace of the land, thousands being allured westward by something in the atmosphere which the worn term "semi-tropic" hints at but does not describe.

Santa Barbara, by the records of her annual temperature and by the absence of the mistral and African sirocco, outrivals the Riviera, and has an Eastern and European contingent year by year to attest the quality of her climate. Paso Robles, aside from its baths, is a charming resort, and Monterey, Del Monte, Pacific Grove, and Santa Cruz are in every way desirable for any season of the year. For scenery, for recreation, for the freedom of the wilderness, with the luxury of a palace, for magnificent gardens and drives, with golf and polo on winter lawns and grassy fields, Del Monte is an ideal place of rest. San Jose in winter is full of sunshine. San Francisco has attractions of its own quite unlike any other place. Its autumns are delightful, its summer days bracing and tonic, and winter sunshine when it comes is radiant and lifegiving.

A chief of the Weather Bureau has said of the City by the Bay: "If a native of San Francisco were asked which was the coldest month of the year he might be unable to answer; and if asked which was the warmest, he might say November. This confusion arises from the comparatively small range of temperature." The records for twenty-eight years show that the warmest month was September, 60.90 degrees; the coldest, January, 50.10 degrees.

Coronado Hotel.

Cliff House, San Francisco.

Boulevard and Beach, Santa Barbara.

Paso Robles Hotel.

This, of course, means the average temperature for the month. A hot day in summer is very rare, and winter has weeks of sunshine with an air that is bracing, invigorating, rarely cold, and often so nearly ideal as to invite one to forsake shop and office, and stay out of doors. Save on rainy days the band plays every Sunday in Golden Gate Park, and thousands crowd the seats and walks and driveways, or wander on the beach itself.

And down the peninsula on which San Francisco is builded; at Burlingame, San Mateo, Belmont, Menlo Park, the country seats of wealth and fashion, and at Palo Alto, the seat of the great Stanford University with its splendid buildings, the climate of the sea spreads out like a fan, modified, tempered by distance and by intervening hills, but making a delightful all-the-year air.

So across the bay to the north, on the Marin shore, there are picturesque towns and summer residences; sheltered nooks very charming all winter; while farther back are the big trees, the redwood groves—the resort of Bohemians; and looming above the bay and its cities is Mount Tamalpais, with Mill valley at its foot, full of homes, and a wonderfully crooked railroad climbing to the mountain-top, and about all the sea air, with its iodynes, and the entrancing vision spread out from the hotel on the summit.

The eastern shore of the bay has Berkeley, the seat of the State University; has Oakland with its background of sunny foothills, and Alameda, more out of the range of the direct air-currents of Golden Gate, and brooded by a more tranquil air than the Bay city. The towns farther inland, but clustered about the bay, all have a modified sea climate, and as delightful for either summer or winter residences as the State can show. Golf links, tennis courts; bicycling, automobiling, driving or walking over the incomparable roads; winter recreations of some sort, are going on nearly all the time.

"You see," one enthusiast said, half apologetically, "there's so much out of doors here"; and the first comers to this land built chimneys only for the kitchen, used the house for shelter, and lived out of doors. A climate that clothes the fields with emerald in January, and invites the invalid out of doors for ten months out of the twelve; that has all the charm of the tropics without their perils—this is the climate that spreads about the chief metropolis of California, but made tonic and stimulating by the breath of the sea.

For mountain scenery, delightful forests, wild canyons, swift trout streams, glacial lakes, wonderful valleys, and meadows at 8,000 and 10,000 feet elevation, ablaze with flowers; for months of sunshine, unbroken by a cloud, unruffled by wind, unvisited by changes of weather; for dry air and dewless nights, the far valleys by day wrapped in haze, and the high peaks shrouded in snow; for all this California is unrivaled. The Shasta region, the region of Lake Tahoe, the Yosemite valley, Hetch Hetchy valley, Tehipitee valley, Kings River canyon—a second Yosemite—the Royal Gorge of the Kern river, wilder and longer and vaster than Kings;

the Giant Forest on the sunny plateaus between the Kings river and Kaweah river; many thousand magnificent sequoias and a greenwood to delight Robin Hood—why, after thirty years the writer is persuaded that no other country offers such beauty, such sublimity, such splendor of cliff and peak, tree and river, canyon and waterfall, such variety of interests and attractions, such wildness, remoteness, and sense of seclusion, yet so readily accessible, and over all such changeless skies, such healing and balsamic air, such absence of storms through the long summers, such luxury of sunshine without oppressive heat even at noon, as the mountains of California.

And when we consider the long seacoast, the air charged with ozone, placid, equable, tonic and invigorating, and the foothills, dry and warm, the land of the camper and summer lounger, and the medicinal springs everywhere, to suit every taste, to relieve every ill that mineral waters can, it would seem that the assertion with which we began is justified, and that California itself is a health resort. It is more: it is the outing-place beyond comparison, the playground of the world, and if "climate makes up fully one-half of human happiness," we have not said too much about that elusive thing which the invalid and the tourist alike seek, and which makes the charm of California.

TRAVELING IN CALIFORNIA.

By ELWYN HOFFMAN.

California can not be measured by the same yard-stick with which we measure other states and countries of the world. Whoever attempts to do such a thing will soon find himself at a loss as to how he shall proceed, and will finally come to the conclusion that here is a land distinct and apart from all others—one that must be judged entirely by itself. In its climate, its products, and in nearly everything else, California stands apart. Even in its transportation facilities this "Land beyond the West" is altogether unlike any other state.

The traveler in California will not only find many of the best features known to transportation anywhere, but he may also enjoy more unique and interesting features than he will be able to find in any other state in the Union. Not alone may he traverse the valleys in the luxurious cars of transcontinental flyers, but he may travel on scenic roads that wind picturesquely up rugged mountains; he may make memorable trips through dark redwood forests on rushing lumber trains; speed over the smooth waterways on fine steamers, or go down to cities by the sea on swiftly flying electric cars.

Within a few miles of San Francisco the traveler will find a most interesting bit of railroading. The Mount Tamalpais Scenic Railway is famous as "the crookedest railroad in the world," and it deserves its title. Winding up to the mountain's crest, from which splendid views may be had of all the surrounding country—the harbor of San Francisco, the city and its environs—this railroad makes such a lot of bewildering turns that the traveler can not help but realize that here is something distinctly out of the usual. Then there is the road up Mount Lowe, but a short distance from Los Angeles, which takes one up a steep incline, more as a "lift" than as a railway, to the Swift Observatory and Alpine Tavern, thousands of feet about sea level. The famous Tehachapi Loop of the Southern Pacific Company is still another interesting feature in railroading to interest the traveler.

But travel in the Golden State is not confined to rail. California has particularly fine waterways. The San Joaquin and Sacramento rivers drain the greater portion of the State, the latter being open to navigation for a distance of two hundred miles. The bay of San Francisco is one of the largest and finest in the world, and all sorts of craft plough its waters.

Staging in California is not today what it was years ago, before the shining steel of the railroads was laid up and down the broad valleys and over the mountains. Yet even now, the traveler may experience something of that which made the glory of the "other day." The most famous stage lines in California, and perhaps in the world, are those from Raymond and Merced to the Yosemite Valley. One there finds the good old-time stage coaches, the dashing teams and the skillful drivers told of in the narratives of other times. The stage roads are oiled during the summer season, and a ride over them is counted one of the finest trips in the State. Raymond is the Southern Pacific's route to the great valley, the Santa Fe reaching Yosemite from Merced, by an interesting stage line which passes en route the Merced big trees.

All these things give piquancy to travel in California, and make the traveler realize that the State is unique even in its transportation.

The traveler who comes to California by rail has a wide choice of routes. The Atchison, Topeka & Santa Fe Railroad enters the State at its southern door. The Grand Canyon of Arizona, the cliff dwellings and the petrified forests are on the line of this railroad, and are so much a part of the sight-seeing of a California trip that they may be properly mentioned in this article, although they occur a little before crossing the California line.

The Southern Pacific Company reaches the State by three routes. The Shasta route enters California from Portland, Oregon, across the Siskiyou mountains, through some of the finest scenery in the world. Indeed, this is a great scenic route, and many a traveler has looked out upon the heavily wooded mountains and the dark gorges, and felt his heart stir within him long before the train, rushing down toward the sunny valley of the

Sacramento, bore him into view of hoary, majestic Mount Shasta. The Ogden route brings one into the State across the Sierra Nevadas, through a wonderland of grand views, from Lookout Mountain to famous Cape Horn. The Sunset route comes in from New Orleans via Yuma, through the same great southern gateway utilized by the Santa Fe. Both companies afford the traveler everything that is up to date and luxurious, and their trains are reckoned among the finest in the world. At one time it was a long distance from the East to California, but today it does not seem so far. The trip that took the pioneers so long to make "across the plains" is now but a matter of hours. Three days from Chicago will land one at San Francisco.

UNION FERRY DEPOT, SAN FRANCISCO.

California has an area in square miles larger than the combined areas of New York, New Jersey, Vermont, Maine, New Hampshire, Connecticut, Ohio and Massachusetts. There are thirty-five steam roads operating in the State today, with a total mileage of about six thousand. Many of these are held by lease or otherwise, so that they form part of the two principal railroads of California—the Southern Pacific and the Santa Fe. The Southern Pacific is the pioneer line, being practically California's first railroad, the present company having grown out of the Sacramento Valley road and the Central Pacific. The first railroad connecting California with the East was started at Sacramento in 1863, and was built through the rocky barriers of the Sierra Nevada mountains.

The principal railroads in California at present are the lines through the San Joaquin and Sacramento valleys, the coast lines, and the lines in Southern California. These cover the greater portion of the State, and afford the traveler transportation facilities to nearly every point to which he may want to go.

Let us suppose that the traveler enters California by the Shasta route. After crossing the Siskiyou mountains at the northern end of the State, and passing Mount Shasta, he is brought down the canyon of the Sacramento river to the head of the great Sacramento valley. When the traveler arrives at this point he is at the northern end of the great interior basin of California, and just about to enter one of the great agricultural sections of the State. And there at the head of the valley he will be confronted by the question of routes. The main line branches here, one branch swinging away through the rich farming country on the west side of the valley, while the other follows the course of the Sacramento river, branching again before the lower end of the valley is reached. By these lines the traveler can reach any part of the Sacramento valley, and by still other branches turn aside into the rich foothill districts. The Ogden route of the Southern Pacific comes into the Sacramento valley at its lower end, and both of these lines join it and take the traveler to San Francisco.

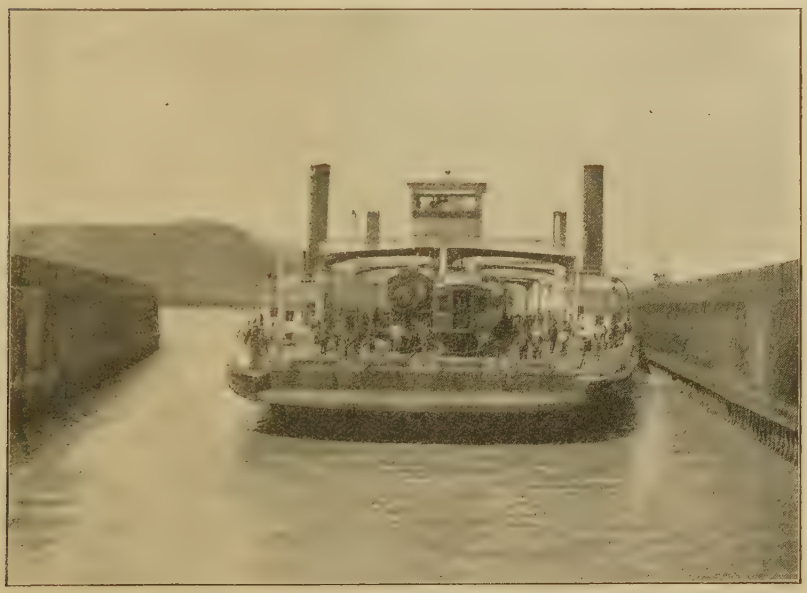
Both the Southern Pacific and the Santa Fe enter the San Joaquin valley at its southern extremity, coming in over the Tehachapi mountains on the same track. The former has two main lines the entire length of the valley, while the Santa Fe has two main lines for over half the distance. All the principal cities in the San Joaquin valley are connected by these lines, and there are several loop lines and branches which tap outlying sections. One of the Southern Pacific's branch lines reaches Raymond, the point at which travelers take stage for Yosemite Valley and the Big Trees. The Yosemite route of the Santa Fe is from Merced, on its main line.

Just as the rivers which drain this great interior basin turn at last and flow into San Francisco bay, so do all these various lines of railroad make their way to the western edge of the State until, broadly speaking, they enter San Francisco at the same point. The Santa Fe line terminates at Point Richmond and Oakland, and the lines of the Southern Pacific at Oakland, both places being just across the bay from San Francisco.

San Francisco, being the principal city and main seaport of the Pacific Coast, constitutes the objective point for transportation lines. The traveler will find it easy to leave San Francisco in any direction which he may want to go. Besides the lines just spoken of, there are other roads which come into San Francisco. The California & Northwestern runs from San Francisco a distance of some two hundred miles northward through the fertile Sonoma and Russian River valleys, bringing the traffic of those rich sections to the metropolis. There is a coast line of the Southern Pacific system running down the San Francisco peninsula. The North Shore Railroad passes north through picturesque Marin

county, and will carry the traveler to the immediate north coast. The Mount Tamalpais Scenic Railway connects with this line, and gives the traveler the unusual experience of its wonderful, winding route.

The traveler will see ships of all nations in the great harbor of San Francisco, and perhaps may note, in-coming or out-going, the great liners of the Pacific Mail, the Occidental & Oriental, or the Oceanic steamship companies, bound to or from China, Japan, Hawaiian Islands, the Philippines or Australia. Or he may note the steamers of the Pacific Coast Steamship Company, which reach all the ports of the Pacific coast, Central and South America, and Alaska. Here, too, he may see other steamers leaving San Fran-



FERRYBOAT SOLANO—LARGEST IN THE WORLD.

On main line of Southern Pacific. Conveys two whole trains at one trip.

cisco for Alaska, Cape Nome, and other northern points, and may also notice on the bay the river steamers from the San Joaquin and the Sacramento. All the railroads which enter San Francisco have fine transfer steamers on the bay, so that the traveler finds no difficulty in crossing at any hour he wishes.

The traveler may go from San Francisco to Los Angeles by two routes. The Southern Pacific will take him by its coast line "the way of the missions," and either the Southern Pacific or the Santa Fe will carry him by the other route, through the San Joaquin valley. The coast line covers the country from San Francisco to Los Angeles, with many loop lines and branches, and affords the traveler a chance to visit all the important places along the coast for that distance. The main line goes south down the San Francisco peninsula, while a broadgauge and a narrowgauge

line leave Oakland and Alameda respectively, and reach San Jose, in the heart of the Santa Clara valley, via the east side of the bay. The narrowgauge runs west to Santa Cruz, while the main line continues southward. One of the most important branch lines is the line that runs out of Castroville, reaching famous Hotel Del Monte, Monterey and Pacific Grove. From Castroville the main line takes the traveler to Paso Robles, San Luis Obispo, Santa Barbara and then to Los Angeles.

The city of Los Angeles is another objective point for transportation, and it is here that all the lines of Southern California converge. The Sunset route of the Southern Pacific comes to Los Angeles, and the Santa Fe reaches it by the Southern California Railroad, which is a part of its system. By this latter line the traveler may reach San Diego, and all that portion of the State which lies along the coast immediately south of Los Angeles. It also reaches Coronado Beach and many other famous resorts.

The Santa Fe in Southern California has many attractive trips to offer, but swinging around the "Kite-shaped track" is the one that appeals to those who desire to get a glimpse of the most characteristic scenes in the shortest time. It embraces a ride over one hundred and sixty-six miles of railway through scenes which illustrate the beauties of Southern California. It is unique in the fact that not one mile of the trip is duplicated, and at only one point, San Bernardino, where the two lines cross, is the same scene twice viewed. It begins and ends at Los Angeles, and may be traveled either going via Pasadena, returning via Orange, or vice versa. The more popular way is from Los Angeles through the Arroyo Seco to Pasadena, Santa Anita (Baldwin's ranch), Monrovia, Azusa, Upland, North Cucamonga, Rialto, San Bernardino, Redlands, Mentone, Highland and Arrowhead; Colton, Riverside, Corona, Santa Ana canyon, Orange, Fullerton and La Mirada, back to Los Angeles. It can be made in a day. The drive or electric car ride either to Smiley Heights in Redlands, or down Magnolia and Victoria avenues at Riverside, will well repay any person desirous of viewing these beautiful places.

The "inside track" of the Southern Pacific covers a large portion of the country southeast of Los Angeles, and will take the traveler to Riverside, San Bernardino, Pasadena, and other places in the heart of the orange district.

The San Pedro, Los Angeles & Salt Lake Railroad, the new Clark line, is only partially completed at present, but will be finished soon. This line will certainly be an important factor in the transportation development of Southern California. It will extend from San Pedro to Los Angeles, and thence across the Mojave desert to Nevada. When this line has been completed, the traveler will have still another route into California.

The southeastern part of the State is reached by the Carson & Colorado Railroad, a line in the Southern Pacific system which enters at the town of Queen and runs to Keeler, on the edge of Death valley. This line gives transportation facilities to Mono and Inyo counties, and to the Tonopah mining district of Nevada.

The Nevada, California & Oregon Railroad is an important line in the northeastern part of the State, and will probably become of much more importance in the future. This road enters California at Purdy, Plumas county, and runs northward a distance of one hundred miles to Termo, Lassen county, giving an outlet to the great stock ranges of Northern California and Southern Oregon.

The traveler who goes north of San Francisco to Humboldt and Del Norte counties will find few railroads, and those principally private lines owned by lumber companies. The most important of these lines are the Eureka & Eel River Valley Railroad, now owned by the Santa Fe; the Arcata & Mad River Railroad, and the Eureka & Klamath Valley Railroad. The large transportation companies of California are alive to the fact that this section is a very rich one, and it will not be long before there will be many roads throughout these northern counties.

One of the things which will appeal to any traveler in California is the service afforded by electric lines. The last few years have witnessed a deal of activity in this direction. Every large city in California is now the center of a network of electric lines. To a certain extent, these electric roads have revolutionized local transportation in many parts of the State. There are fine electric lines in the Santa Clara valley, and in all the most important parts of the San Joaquin and Sacramento valleys. The electric lines in and around Los Angeles give that city an unexcelled suburban service. These lines reach all the important towns near Los Angeles, and compare most favorably with the best Eastern lines. The rails and cars are heavy, and the time made is exceptionally fast. Many new lines are being built throughout California, and every existing electric railway company is constantly broadening and extending its service.

PAST AND PRESENT OF THE FRANCISCAN MISSIONS OF CALIFORNIA.

By SENATOR J. R. KNOWLAND,
President of California Historic Landmarks League.

Within recent years there has been a very perceptible awakening of interest in the Franciscan missions, a subject which forms a unique and fascinating chapter of California's picturesque and romantic history. As a result, organizations have been formed in both Northern and Southern California with the object in view of preserving and restoring the remaining missions—landmarks around which cluster a flood of historic memories of the pastoral days of long ago.

But two links are missing in that chain of missions, twenty-one in number, which stretched from San Diego in the far south to Sonoma in the north. San Rafael Arcangel and Santa Cruz missions have entirely disappeared, not an adobe brick or tile remaining to designate the former locations of these one-time flourishing establishments. Of the remaining nineteen, Soledad mission, in Monterey county, is a hopeless ruin, the rains of each succeeding winter gradually leveling the few desolate adobe walls, pathetic reminders of pristine glory.

After practically a century of neglect, during which time the hand of vandalism was not stayed, Californians are fortunate, now that public sentiment is aroused, that more of these ancient piles are not shapeless, crumbling masses beyond human power to restore. Today eighteen of the California missions are in a condition to be preserved for posterity, but in a number of instances the chapels have entirely disappeared, other buildings, however, which formed a part of the respective establishments, having withstood the ravages of time.

The Order of Franciscans, when they importuned Carlos III. for the necessary authority to plant the cross in Alta California, were actuated by naught but pure and unselfish motives. When at last Spain granted the permission so long coveted, the dispelling of the darkness of paganism was by no means the controlling influence which prompted the action of the Spanish court. The importance of extending its dominion over the north had long been realized. The existence of the desirable ports of San Diego and Monterey was known. Had these California ports been occupied they would have been found most serviceable to the Manila galleons, richly laden and often sadly in need of repairs and fresh provisions, which sailed from the west by the northern route. Pirates would sometimes temporarily occupy these ports while lying in wait for the Spanish galleons.

The fear of Russian encroachments also exerted an influence in arousing the Spanish authorities to the necessity of occupying California—a fear which was well grounded, as events later proved, for in 1812 the Russian government established a fort known as Ross, within the present county of Sonoma. Remains of Fort Ross still exist.

Military as well as spiritual was to be the first civilized occupation of California. Both presidios and missions were to be established. At San Diego in 1769 the first mission was founded by the president of the Franciscans, Father Junipero Serra. Land and sea expeditions—two of each—had been fitted out in Baja (Lower) California, and it was upon the arrival of the last of these several detachments that the cross was planted and the spiritual conquest of Upper California begun.

In 1774 San Diego de Alcala mission was moved six miles from the original site, the location of the present ruins. R. H. Dana Jr., in his "Two Years Before the Mast," tells of a visit he paid to the mission in 1834: "After a pleasant ride of a couple of miles we saw the white walls of the mission. There was something de-

cidedly striking in its appearance: a number of irregular buildings, connected with one another and disposed in the form of a hollow square, with a church at one end rising above the rest, and with an immense iron cross at the top." Continuing his description of the buildings as they appeared after they had been practically deserted, Dana adds: "Just outside of the buildings, and under the walls, stood twenty or thirty small huts, built of straw and branches of trees. Entering a gateway we drove into the open square, in which the stillness of death reigned. On one side was the church; on another a range of high buildings with grated windows; a third was a range of smaller buildings, and the fourth seemed to be little more than a high connecting wall."

SANTA BARBARA MISSION.

The one that has been perfectly preserved. The California building is modeled from it.

The padres of San Diego mission were the pioneers of irrigation. A few miles above the mission are the ruins of a dam built fully one hundred and thirty years ago to supply the mission with water. This dam was thirteen feet in thickness and covered with cement that became as hard as stone.

Only a portion of the chapel of San Diego mission remains. The Landmarks Club of Southern California has expended $500 in safeguarding the few walls of this, the mother mission.

San Carlos Borromeo (Carmelo) mission was the second to be founded. The first land expedition, under the leadership of Portala, was unsuccessful in locating Monterey, continuing north and discovering San Francisco bay. This expedition returned to

San Diego. Undaunted by failure, a second expedition, composed of a land and sea detachment, was later fitted out. Both divisions arrived but eight days apart, and upon the shores of placid Monterey bay the royal colors were unfurled, the cross planted, and under the spreading branches of a great oak, mass was said by Father Serra on the 3d of June, 1770. A year later a more suitable site was chosen near the bay and river Carmelo. The mission is now known both as San Carlos and Carmelo.

In volume II of "A Voyage 'Round the World," by J. F. G. De La Perouse, appears a very valuable and interesting description of mission life in 1786, during which year this noted traveler visited San Carlos mission. As he approached the mission establishment he was met by the president, who was clothed in his ceremonial habiliments. "Before we entered the church we passed through a square in which the Indians of both sexes were ranged in a line." Within the church were noticed pictures of hell and of paradise. The house of the missionaries, as well as the different storehouses, were opposite the church. The Indian village, consisting of about fifty huts, which served for seven hundred and forty persons of both sexes, stood on the right and were most wretched. La Perouse furnishes an entertaining description of the daily routine of mission life:

"The proselytes are collected by the sound of a bell; a missionary leads them to work, to the church, and to all their exercises. The day consists in general of seven hours labor and two hours prayer: but there are four or five hours prayer on Sundays and festivals, which are entirely consecrated to rest and divine worship. The Indians, as well as the missionaries, rise with the sun, and immediately go to prayers, which last for an hour. During this time three large boilers are set on the fire for cooking a kind of soup, made of barley meal, the grain of which has been roasted previous to its being ground. It is called atole. They eat it without either butter or salt. Each hut sends for the allowance of all its inhabitants in a bowl made of the bark of a tree."

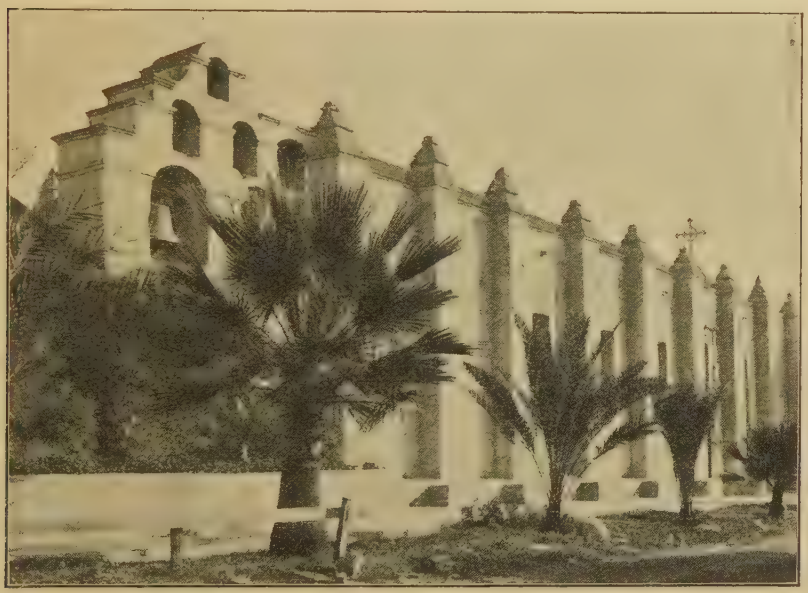
San Carlos mission has been "restored," a peaked shingle roof destroying the original beautiful lines of the chapel. Within the church rest the remains of President Junipero Serra, but it was not until 1882 that his resting-place was definitely located and suitably inscribed. In the vicinity of the chapel are a number of ruined walls.

San Antonio de Padua (Saint Anthony of Padua) mission, in the present county of Monterey, twenty-six miles from the railroad, was founded in 1771. Visit this landmark and you will become an enthusiastic advocate of mission restoration, for around these old ruins hovers an atmosphere of the mission days of long ago. The roof of the once imposing chapel has fallen. The long cloistered monastery adjoining is in ruins, although a number of the picturesque arches of red pressed brick still stand. Remnants remain of the dipping vats used for tanning, and of the old flour mill with its crude waterwheel. The water for this wheel was brought in a stone-walled ditch which can still be traced. It was

driven through a funnel-shaped flume so as to strike the side of a large waterwheel revolving horizontally on a shaft.

The California Historic Landmarks League last year expended $1,000 in repairing San Antonio mission. The great breaches in the adobe walls of the chapel, five feet in thickness, were filled and a portion of the roof frame placed. It is hoped to complete the work during the present year. The plans have been approved by well-known artists and architects who are members of the League's advisory committee, thus insuring intelligent and artistic restoration.

Mission San Gabriel Arcangel (the Archangel Gabriel) is located about ten miles from Los Angeles and is one of the most frequently



SAN GABRIEL ARCANGEL, LOS ANGELES COUNTY.

visited of the missions. The chapel alone remains and is in good state of repair. San Gabriel was one of the richest of the missions, possessing at one period a hundred thousand head of cattle, besides horses, mules and sheep. The extensive gardens produced oranges, citrons, pears, figs and grapes in abundance. From four hundred to six hundred barrels of wine were made annually. As an example of the skill of the Indian neophytes, under their able instructors, we are told that one of the first vessels launched in California, a schooner of about sixty tons, was framed at San Gabriel and fitted for subsequent completion at San Pedro. Every stick of timber, after being hewn and fitted, was brought down to the beach upon carts, a distance of over thirty miles.

San Luis Obispo was the fifth mission, and was founded in 1772. Its present appearance is disappointing, for a modern

church steeple has been added, removing, as has well been stated, every vestige of the days of long ago. It was at this mission that the use of tiles for roofing was first adopted, frequent fires having demonstrated the uselessness of thatched tule roofs.

San Francisco de Asis (Dolores) mission was founded in the memorable year 1776. The name Dolores was derived from the lagoon Dolores, upon the banks of which the mission was located—a lagoon which has long since disappeared. The buildings of Dolores mission formed two sides of a square without any apparent intention of completing the quadrangle. There were buildings for melting tallow and for making soap; smith shops, carpenter shops, and magazines for storing tallow, etc. Kotzebue speaks of the church orchestra he heard when he visited this mission in 1812, which consisted of a violoncello, a violin and two flutes; these instruments were played by little half-naked Indians who were very often out of tune. A modern church adjoins the old chapel, contrasting the present with the past. In the old graveyard adjoining the church twelve thousand people are said to lie buried.

The most beautiful of the old mission churches was the chapel of San Juan Capistrano (St. John Capistran). This imposing edifice was erected under the supervision of an imported master mason. It was built of stone and mortar, the stones not being hewn, but of irregular size and shape. Over nine years were occupied in its building. It was cruciform in shape and was 146 feet in length by 28 feet in width. It has been stated that this structure could not be duplicated today, with a railroad at its doors to bring materials, for $100,000. It was surmounted by a bell tower 125 feet in height. This church was destroyed by a great earthquake in 1812, and was never rebuilt, ruins of the altar end still standing. This great temblor visited California on a Sunday morning, unfortunately, when mass was being celebrated beneath the vaulted roof of the great church, and forty were crushed to death. A number of the buildings of San Juan Capistrano still stand. The Southern California Landmarks Club has restored with tiles 387 feet in length of the principal building, and with gravel and asphalt an area of 5,250 square feet of corridors. It has buttressed the crumbling stone pillars which support all that is left of the great church.

The fertility of the beautiful Santa Clara valley was early recognized by the padres, and in 1777 the mission of Santa Clara (Saint Clara) was founded. The average crop of grain was 4,888 bushels. The Santa Clara chapel is still well preserved, but a modern wooden front removes all character of the mission period.

The two links to be next added to the chain of missions were within the present cities of Ventura and Santa Barbara. The first, San Buenaventura, was founded in 1782; the second, Santa Barbara, in 1786. Civilization knocks at the very doors of both these establishments. Business houses surround the mission at Ventura, and an electric car line terminates at the threshold of the best preserved and most widely known of the California mis-

sions, lying in the foothills of Santa Barbara. When Santa Barbara mission flourished there were within the inclosing walls two hundred and fifty adobe buildings.

La Purisima Concepcion (the Immaculate Conception), fast being despoiled by the elements, is near Lompoc, Santa Barbara county. Steps are now being taken to restore the one remaining building.

Santa Cruz (Holy Cross) mission exists only in memory, but a flourishing city bears the name of this former mission by the sea.

Soledad mission, or more properly, Neustra Senora de Soledad (Our Lady of Solitude), with its few crumbling walls, pleads more eloquently the cause of restoration than the power of words.

SAN LUIS REY, SAN DIEGO COUNTY.

These ruins are within the present county of Monterey, several miles from the town of Soledad.

The two missions which followed, San Jose de Guadalupe and San Juan Bautista, are not frequently visited, located as they are some miles from the railroad. Nevertheless, they are well worth a visit, particularly the latter, situated within the quaint old town of San Juan, in San Benito county.

Poor old mission San Jose. Formerly one of the most flourishing, little now remains to recall its past glory. The chapel has disappeared, a single, but picturesque, adobe building remaining.

A modern church steeple was years ago added to San Juan Bautista's chapel, but even the elements rebelled. A furious gale one winter's night leveled this hideous addition, the remainder of

the mission escaping unharmed. The well-cared-for garden at San Juan, its beautiful arches and numerous relics are attractive features.

From the car windows on the Southern Pacific coast road between San Francisco and Los Angeles, a view is had of San Miguel mission. The exterior is plain, but the interior most interesting.

With the exception of San Antonio mission, San Fernando Rey de Espana, twenty miles north of Los Angeles, is one of the most interesting, owing to its untouched state of decay and the acres of surrounding ruins. The Southern California Landmarks Club has reroofed the chapel and monastery of San Fernando.

The most prosperous of all the missions, and one of the most imposing architecturally, was San Luis Rey de Francia, four miles east of Oceanside, in San Diego county, a small station on the line of the Santa Fe railroad. This mission contained at one time 2,869 neophytes, nearly one thousand more than any other mission. An idea of the extent of this mission can best be gained by quoting from Alfred Robinson, an early American traveler and writer, who visited the establishment in 1829. He states: "The buildings occupied the sides of a large area, eighty or ninety yards square, in the center of which was a fountain with a constant supply of pure fresh water. The buildings around this court were divided into separate apartments for the missionaries, major domos, storerooms, workships, hospital, and rooms for unmarried females. There was also a guardhouse and storehouses for the grain." Today the imposing church is all that remains, with the exception of the beautiful arches, the original number of which was thirty-two, which were ornamented with latticed railings. These arches supported the long corridor, back of which was the square inclosure, or patio, mentioned by Robinson.

Three more missions were founded and then the chain was complete, stretching from San Diego to Sonoma. Santa Inez, after Saint Agnes, was founded in 1804. It is located within the present county of Santa Barbara, twenty miles from Gaviota, a station on the Southern Pacific coast line. The chapel is free from architectural ornament. The monastery with its arched corridor still remains.

San Rafael Arcangel, like Santa Cruz mission, has disappeared, its location being within the present town of San Rafael, in Marin county.

San Francisco de Solano mission, the last to be founded, never enjoyed great prosperity. This mission is within the present historic old town of Sonoma. The remaining buildings belonging to this mission, not being the property of the church, were recently purchased with a portion of a landmarks fund raised by a San Francisco newspaper, and will be turned over to the State of California when the legislature convenes. The date of founding was 1823.

It is difficult at this present day to fully realize the vast extent of the mission establishments when they were in their zenith.

Each mission was practically a city by itself, and not merely, as many now imagine, a church within which the Indians received religious instruction. The maximum number of neophytes at the least prosperous of the missions, Santa Cruz, was 523; at the most prosperous of the establishments, San Luis Rey, 2,869; the average for the twenty-one missions being over 1,300, a total of nearly 28,000 between 1800 and 1830, the golden age of the missions. These untutored savages were trained in all the handicrafts necessary for a self-supporting community.

When in 1834 the robbery of the missions commenced, known under the diplomatic term of secularization, their downfall was

SAN ANTONIO DE PADUA, MONTEREY COUNTY.

rapid. They were sold for beggarly sums and the vast tracts of land confiscated. In a number of instances these sales were later set aside by the United States government, when California came into its possession, and the majority of the remaining missions are still the property of the Catholic Church.

The Franciscan missionaries were the original pioneers of California, sowing the first seeds of civilization, establishing the first permanent settlements in Alta California, and enduring hardships almost beyond human comprehension. In restoring the missions, Californians are not alone paying deserved honor to the sacred memories of those devoted padres, but are preserving the most imposing landmarks, both historically and architecturally, that exist within the United States.

CALIFORNIA'S CALL TO THE IMMIGRANT.

By JOHN P. IRISH.

It is not pretended that California supplies any specific from the wealth of her soil and sunshine that will cure unthrift, bad judgment, and lack of faculty, or make of the do-less a doer. But there is legitimate basis for the belief that here the average man may work in greater comfort more days in the year and earn his bread easier than under the conditions that prevail in any other state or country.

California is a winterless land. No deep frosts chill the ground; vine and fig tree do not have to thaw out as a preliminary to going into business as fruit-bearers. All stone fruits, and the fig, pomegranate, orange, lemon, lime, pear and apple are precocious bearers. The peach will bloom the second year from the pit. On the Mediterranean the olive fruits meagerly at seventeen years of age; here it bears a full crop at seven. In the East he must be a young man who plants a tree expecting to repose in its shade or to eat its fruit. Here old men may plant, and surely expect to enjoy the results. The growth of animals is not checked here by the withering winter, and a yearling horse is the equal of any Eastern two-year-old.

But, it may be asked, is not this precocity of animate and inanimate life compensated by early decay? The answer is, No. That rule has here its exception. The peach tree that blooms before the shell of the pit that bore it is decayed, bears on for thirty years, or more. Olive trees that furnished oil for the sacraments of the old Mission Fathers a hundred years ago, shade the graves of the gardeners who planted them, and ripen their yearly crop with unabated energy.

But men fail in California? Yes. Men who buy land and hire it planted and worked, running it on the absentee landlord system, fail here and everywhere. So do men fail who run manufactures and trade on the same system. But men who take here only so much land as they have the means and the ability to conserve, and can properly till and tend with the labor of their own families, do not fail; for here Nature helps the industrious hand, and nowhere else does intelligent labor add as much to the value of the land, for the reason that here Nature holds one handle of the plow.

The advantage that California has in climate where growth and production go on without pause is seen when the farmer finds his vines and trees, fields and truck-patch, producing something for the market every month in the year.

What effect does the climate have on the cost of living? Where

the pastures yield natural forage, green or dry, every day; where the water never freezes; where vegetable growth goes on forever, and the storage of vegetables for winter use is never necessary, because they are growing and fresh daily, it is natural that the cost of living should be less than where the summer and fall are spent in hard labor to store food and fuel against the long winter that suspends production. Beef and mutton from the ranges; fish from the waters; fruits and vegetables, reach market here in a condition for use more cheaply than elsewhere.

The economic value of climate should be considered in selecting a home: first, in respect to the health of the family, and, second, in respect to the number of days yearly in which your vocation may be followed. California, it may be said, has no endemic diseases. Except in the high Sierra mountains the snow does not impede outdoor occupation. There are no tornadoes or chilling blasts, nor are there any sudden changes in temperature which imperil life. The heat in the valleys, though high as indicated by the thermometer, is not excessive enough to prevent labor in the fields on the hottest days; because the air being dry, the latent heat of the body is rapidly eliminated, and the blood is kept cool. It will bear repetition that every day in the year is a working day. It follows that it costs less to live in California than in any other state in the Union, and the comfort of life is greater.

The intending settler should fix firmly in his mind the topography of California. We have a winter season called "wet," and a summer season called "dry." In the winter months the average rainfall is about twenty-five inches, distributed through four months of the year, and this is ample to insure abundant crops. California is 850 miles long. Her coast-line extends as far as from Boston to Savannah. At the same altitude the climate is practically the same in the north as in the south of the State; hence San Diego in the south and the country 600 miles to the north produce identically the same crops. On the west slope of the Sierra Nevada mountains, at an elevation of from 400 to 1,000 feet, is the famous foothill warm belt, stretching from Shasta to Kern county, and noted for the superiority of its fruits, including the fig, orange, lemon and olive.

There is one great valley; its south end rests on the Tehachapi mountains, and its north end is lifted up by Mount Shasta. This great trough sags in the middle, and the rivers that run from each end escape into San Francisco bay through a common delta. From these rivers we name each end of the valley, thus giving the impression that there are two valleys. The north end of the valley is the valley of the Sacramento, with an area of 4,000,000 acres. The south end is the valley of the San Joaquin, with 7,000,000 acres. This valley is the seat of wheat and raisin culture. On the west of this great valley rises the Coast Range, in which lie a number of fertile and extensive valleys, such as Santa Maria, Sonoma, Santa Clara, Vaca and Suisun. In most of these fruit-growing is the principal industry. The slopes of the Coast

Range, toward the sea, and the high Sierra, are favorable for dairying. To some extent, therefore, the settler is guided in the selection of his residence by the business he desires to pursue.

We expend annually over $7,000,000 for the maintenance of our public schools. The State is entirely out of debt. The financial report shows that the State debt is about $2,500,000, but this is only a form of statement. There is that amount of State bonds, but the bonds are owned by the State and are covered into the State school fund. The State pays the interest to the State school fund, which is annually apportioned to the public schools. If California has a reputation for public extravagance it is undeserved, and the intending immigrant need not hesitate for fear his interests will suffer by reason of high taxation, due to the waste of public money.

It is not given to all men to be wealthy; but every original fortune in this country was founded in some man's determination to make a living and provide for life's decline when labor is impossible. Immigration flows where a living may be made under the most favorable conditions. The variety of resources in California invites an equal variety of tastes, training and experience. If a man desires to mine, along the western flank of the Sierra Nevada mountains for 800 miles is the world's greatest gold field. It has already yielded $1,000,000,000 from the merest scratching of its surface.

Horticulture here rises to the rank of a profession. Our soil and climate are so adapted to it that fruits from every zone may be grown. The clemency of our climate and its halcyon quality invite enterprise and ingenuity to experiment in all horticultural refinements. No equal area of the earth's surface has produced profitably a variety of the fruits of tree, vine and shrub equal to that of California.

The beginning of all successful manufacture is in the transmutation of the most abundant raw material into more merchantable or more permanent forms for transportation and use at a distance. The State is not yet sufficiently supplied with plants for drying and canning our surplus fruits, or for reducing them to fine jellies, jams, pickles, pastes, etc. Immigrants who have a taste for these arts will find here a growing field.

No place presents better facilities for variety farming as it is practiced in the Mississippi valley. With a small tract of land which may be cared for by the labor of an ordinary family; with some orchard and vineyard bordered with almond and English walnut trees; producing some alfalfa and grain, and carrying some cows, pigs and chickens, the owner will find something produced for market every day in the year, while his family living will nearly all come direct from the soil he tills.

The reader will find the subjects herein generalized treated in greater detail in other chapters of this book. The treatment is conservative, and is intended to invite that careful personal examination which the prudent man makes who desires to better his condition by changing his abode.

Property of Lillian Michelson
LM 00003765